APRIL, 1955

TECHNOLOGY DEPT.

RUBBER WORLD

NOW IN ITS 67th YEAR

A BILL BROTHERS PUBLICATION

INDUSTRY SELLS CONGRESS PLANT TRANSFER THIS MONTH

see page 81

R v. 132 Ap-S'55

IMPROVE RESISTANCE TO OZONE, WEATHERING, OIL —AT COMPETITIVE COSTS

Replace non-oil-resistant elastomers with NEOPRENE TYPE WHV

You can improve your non-oil-resistant products by using Neoprene Type WHV oil extended compounds instead. This can be done at competitive costs in most cases. In many applications, laboratory and field tests have shown that Type WHV compounds have more ozone resistance and better weathering characteristics than are available with non-oil-resistant elastomers . . . and they do this at competitive costs. Excellent examples of superior products made of Type WHV are extrusions such as window channel; heater connectors; radiator, heater, and vacuum brake hose for automotive use. Automobile manufacturers have found that the change eliminated ozone cracking problems, improved weathering characteristics and provided an oil-resistant part as a bonus. All at no extra cost.

DU PONT RUBBER CHEMICALS

DISTRICT OFFICES:

Akron 8, Ohio, 40 E. Buchtel Ave., POrtage 2-8461
Atlanta, Ga., 1261 Spring St., N. W., EMerson 5391
Boston 5, Mass., 140 Federal St., HAncock 6-1711
Chicago 3, Ill., 7 So. Dearborn St., ANdover 3-7000
Detroit 35, Mich., 13000 West 7-Mile Rd., UNiversity 4-1963
Houston 25, Tex., 1100 E. Holcombe Blvd., JUstin 1432
Los Angeles 58, Cal., 2930 E. 44th St., LOgan 5-6464
New York 13, N. Y., 40 Worth St., COrtlandt 7-3966
Wilmington 98, Del., 1007 Market St., Wilm. 4-5121

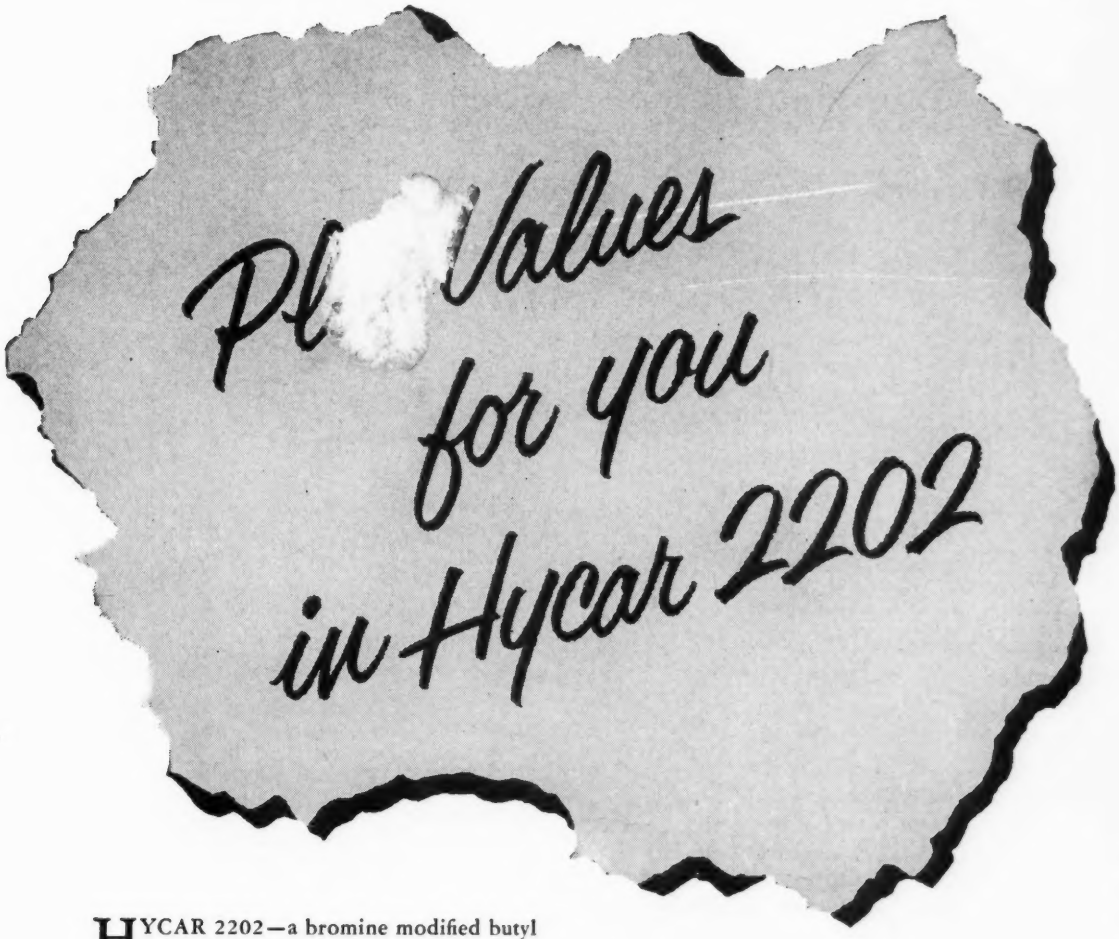
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

RUBBER WORLD, April, 1955, Vol. 132, No. 1. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 1309 Noble Street, Philadelphia, Pa., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription United States $5.00 per year; Canada, $6.00; All other countries $7.00; Single Copies, 50 cents. Address Mail to N. Y. Office.

News about

B. F. Goodrich Chemical *raw materials*



HYCAR 2202—a bromine modified butyl rubber—offers outstanding properties unobtainable with conventional butyl, yet retains the typical butyl properties of excellent ozone resistance, heat and light aging resistance, electrical resistance, and exceptionally low air permeability.

Check these plus values . . . they may add up to important new applications; perhaps show you how to improve an operation or make a superior product.

CURES FASTER, MORE CONSISTENTLY . . . good, consistent cures obtainable using only approximately one-half as much accelerator.

EXCELLENT COMPATIBILITY . . . can be blended and cured with crude, GR-S, butyl, and other rubbers.

SUPERIOR BONDING . . . adheres strongly to butyl, other rubbers, and metals.

WIDE RANGE OF APPLICATIONS . . . cement and adhesives, wire and cable, tire curing bags and bladders, inner tubes, coated fabrics, belts, hose and tubing, and mechanical goods.

Hycar 2202, originally introduced as Hycar HH, is now readily available in commercial quantities. For complete technical information, please write Dept. CL-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U.S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

IT'S PERFORMANCE THAT COUNTS!

Add Thousands of Miles to Tire Life with *Philblack® I*

Outstanding performance . . . that's what you get with the Philblacks! Starting and stopping . . . braking and bad roads . . . hot pavements . . . high speeds, cut short the life of a tire. But the Philblacks give rubber exceptional toughness.

Cold rubber treads made with the Intermediate Super Abrasion Furnace black, Philblack I, proved to be 13% better than HAF blacks in actual tests on passenger car tires under severe road test conditions! And in natural rubber truck tire treads, Philblack I proved to be 18% better than HAF blacks. That's the kind of performance that counts.

For longer life in tire treads, industrial goods . . . any application where outstanding performance is demanded, use the proper Philblack. For complete information, consult our Technical Representative.

Know the Philblacks!

KNOW WHAT THEY'LL DO FOR YOU!

A **Philblack A FEF Fast Extrusion Furnace Black**
Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

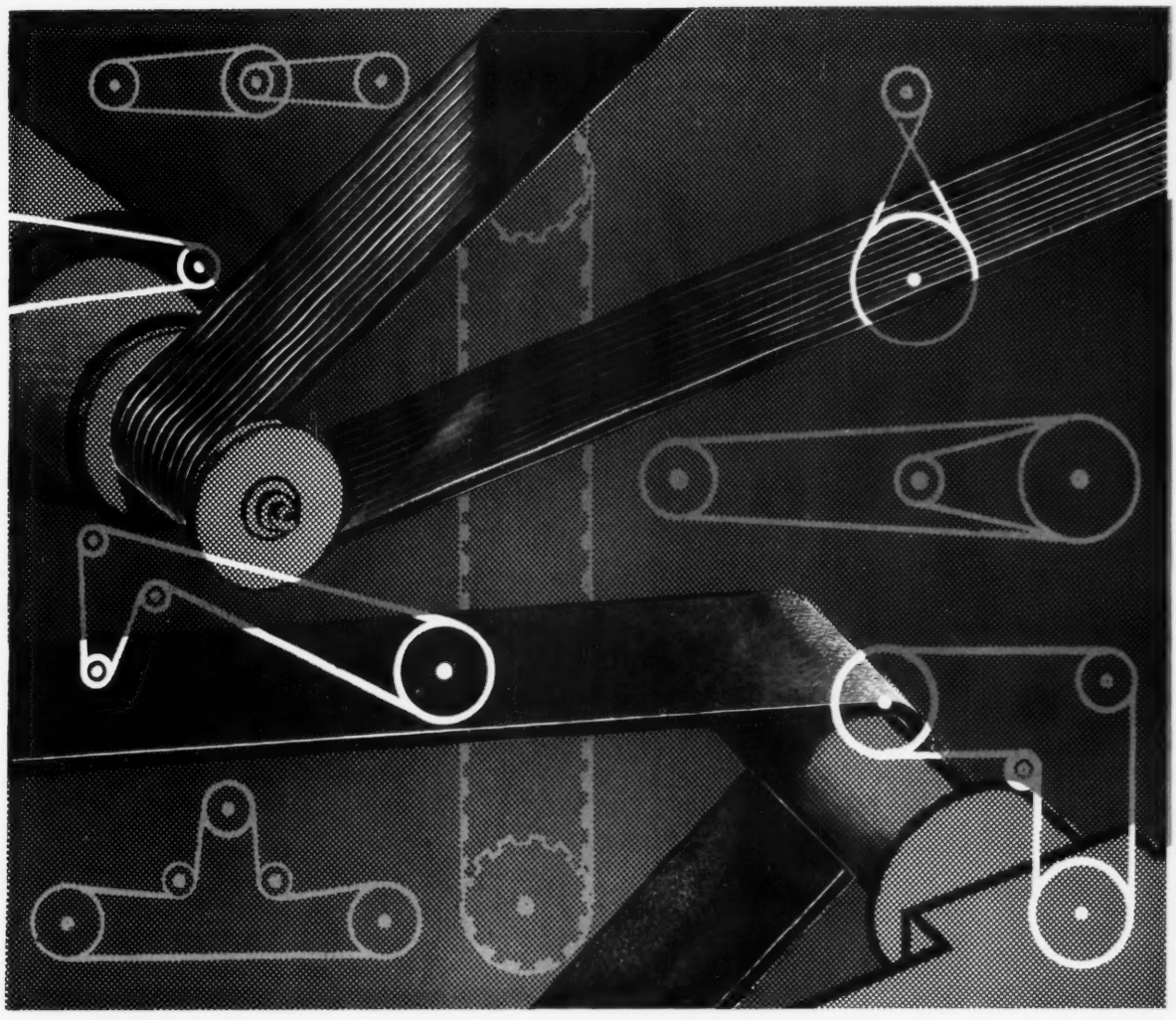
I **Philblack I ISAF Intermediate Super Abrasion Furnace Black**
Superior abrasion resistance at moderate cost. Very high resistance to cuts and cracks. More tread miles at high speeds.

O **Philblack O HAF High Abrasion Furnace Black**
For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

E **Philblack E SAF Super Abrasion Furnace Black**
Toughest black on the market. Extreme abrasion resistance. Withstands aging, cracking, cutting and chipping.

Phillips 66

PHILLIPS CHEMICAL COMPANY, Philblack Sales, 318 Water Street, Akron 8, Ohio. Export Sales: 80 Broadway, New York 5, N. Y. West Coast: Harwick Standard Chemical Company, Los Angeles, California. Canada: H. L. Blachford, Ltd., Montreal and Toronto.



Where Flexibility is vital

FLEXAMINE has no equal!

This superior antioxidant and flex-cracking inhibitor gives transmission, conveyor, and V-belts the *finest possible protection* against cracking, fatigue, and consequent premature failure.

In addition, Flexamine provides outstanding resistance to heat, copper and manganese, and static weather cracking.

Developed by the world's leader in rubber chemicals, Flexamine has proved its effectiveness in such products as tires, mechanical goods, cable jackets and insulation, molded soles, and linesman's gloves and aprons.

A brown powder with a specific gravity of 1.19, Flexamine has good storage stability—melts at 75-90°C—and disperses readily. It requires no handling precautions and is slightly activating. Though usually 1 part per 100 is used, Flexamine is still remarkably effective in amounts as low as 0.2 per 100.

If *lasting* flexibility belongs in *your* product, Flexamine does. Better find out more by writing on your letterhead to the address below. Why not do it *now?*

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

BIGGER BATTERY BOXES

are better made with PLIOLITE S-6B

WHEN the 12-volt battery reappeared on the automotive scene for present day needs, it brought with it problems for container manufacturers. The increased load and limited space provided for the battery called for a lighter casing material than those normally used, yet one of greater structural strength and resistance to impact.

Answer to the problem for compounders of one leading manufacturer was PLIOLITE S-6B. Combined with rubber and other materials, PLIOLITE S-6B gave them a new kind of hard rubber, at a normal sulfur content (3 PHR). It was a tough, high-modulus, heat-resistant compound that made possible a thinner-walled, much lighter container of greatly increased impact resistance and strength. And one that was easily and quickly produced.

PLIOLITE S-6B is a high styrene-butadiene copolymer. It is specifically designed and made to be an easy-processing, thorough-dispersing rubber-reinforcing resin. Its major uses, to date, have been to impart hardness, stiffness and strength, plus resistance to abrasion, flexing and tearing, to relatively soft stocks for use in shoe soles, flooring, wire covering and inflated and molded goods.

One of the newer uses for PLIOLITE S-6B is in hard rubber stocks. These can be conventional hard rubber compounds to which PLIOLITE S-6B alone is added, or special compounds wherein hardness is achieved by combination with other resins. In either case, PLIOLITE S-6B reduces the amount of sulfur required, improves milling and preforming characteristics and provides good control over the troublesome, exothermic nature of hard rubber curing. It also improves hardness, stiffness and tensile, while greatly increasing impact resistance.

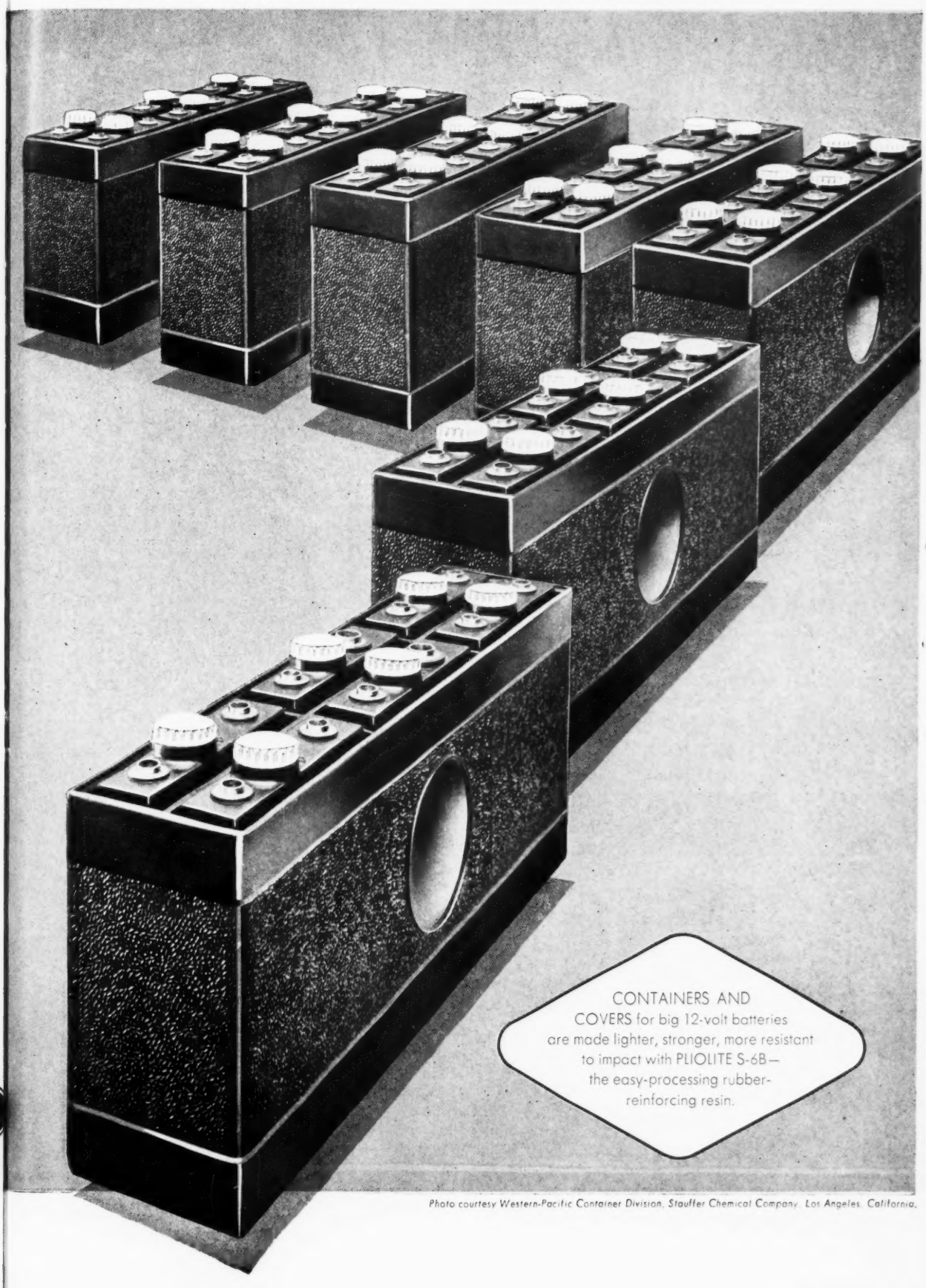
Details, samples and full technical help on the use of PLIOLITE S-6B in the reinforcement of hard rubber and other types of compounds is yours by writing to:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

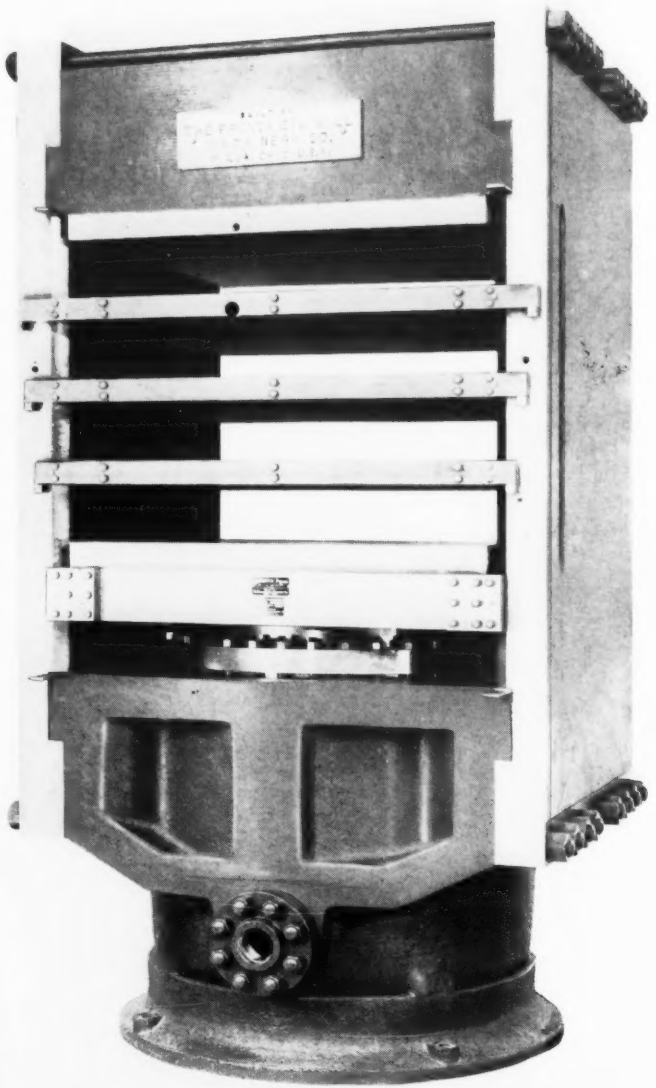
Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

PLIOLITE S-6B...another quality product of Goodyear Chemical Division



CONTAINERS AND COVERS for big 12-volt batteries are made lighter, stronger, more resistant to impact with PLIOLITE S-6B— the easy-processing rubber-reinforcing resin.

Photo courtesy Western-Pacific Container Division, Stauffer Chemical Company, Los Angeles, California.



French patented construction assures permanent rigidity and proper alignment. Although there are no difficult adjustments to make and no nuts to tighten, experience proves that French Side-Plate Presses do not develop "slop" or loose fitting parts. Long dependable operation is made possible by French exclusive features.

Permanent rigidity

Low maintenance

Long mold life

Standard sizes

FRENCH SIDE-PLATE HYDRAULIC MOLDING & CURING PRESS

IMPROVE CLOSE TOLERANCE MOLDING

SATISFY YOUR MOST EXACTING CUSTOMERS

WRITE FOR ILLUSTRATED CATALOG

THE FRENCH OIL MILL MACHINERY CO.
(HYDRAULIC PRESS DIVISION)
1011 GREENE ST. PIQUA, OHIO

INTRODUCING

POLYSAR KRYNAC 801

The new Polysar, Cold, High Oil Resistant Nitrile Rubber

For POLYSAR KRYNAC 801

High Oil Resistant—Krynac 801 is a new acrylonitrile, butadiene rubber, designed for applications where maximum oil resistance is required.

Physical Properties—Krynac 801 is a product of the "cold" polymerization system, offering excellent physical properties, including exceptionally low compression set.

Processing—Krynac 801 is an easy processing polymer having low mill shrinkage, low compound Mooney, low die swell, and high extrusion rate.

Where medium oil resistance is required *look to* Krynac. For High oil resistance *look to* Krynac 801.

Complete technical service and laboratory facilities are yours for the asking. Call us for your copy of our new Polysar Krynac 801 bulletin.

MUEHLSTEIN is the exclusive agent in the United States for:
POLYMER CORPORATION, LTD. OF SARNIA, ONTARIO, CANADA.

H. MUEHLSTEIN & CO. INC

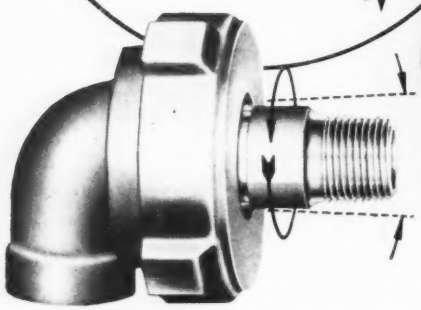
60 EAST 42nd STREET, NEW YORK 17, N. Y.

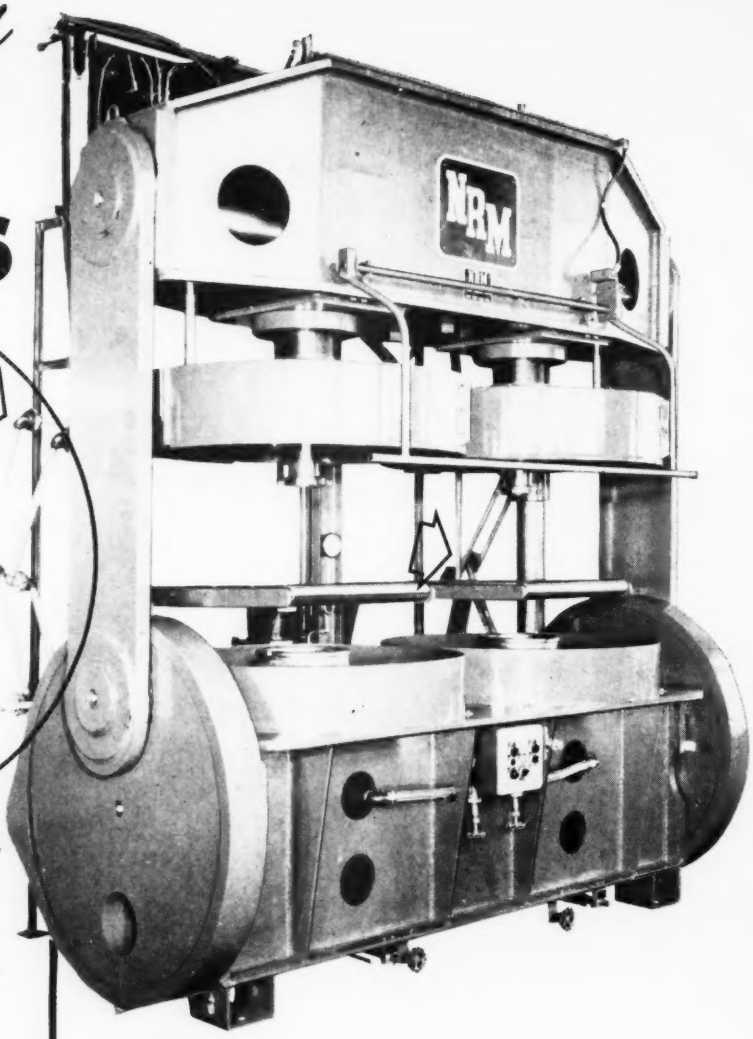
CRUDE RUBBER · SYNTHETIC RUBBER · SCRAP RUBBER · HARD RUBBER DUST · PLASTIC SCRA

REGIONAL OFFICES: Akron · Chicago · Boston · Los Angeles · London · Toron
WAREHOUSES: Akron · Chicago · Boston · Los Angeles · Jersey Ci

Improved BARCO *Swivel* JOINTS

Used by Leading Machine Builders!





- **IMPROVED SEAL** — Barco's new No. 11CTS gasket is amazingly long wearing. Does not bake hard. Ideal for steam and water service. Does not cause excess wear on other parts.
- **LEAKPROOF, HOT OR COLD** — Joints stay tight regardless of pressure or temperature.
- **SELF-ALIGNING** — Up to 10° side flexibility. This Barco feature saves time, cuts costs, and insures perfect performance.
- **ENGINEERING RECOMMENDATIONS** — Send for a copy of Catalog No. 265A and installation drawing 10-52004.

SEND FOR CATALOG 265A

NATIONAL RUBBER MACHINERY COMPANY

of Akron, Ohio, and maker of the new NRM Packless Autoform Vulcanizer shown above, is one of the leading machinery builders who use Barco "Self-Aligning" Swivel Joints on dog leg piping connections to movable platens and molds. In a report on the performance of the equipment, the company writes, *"We have found Barco joints completely successful for this application."*

Use of improved Barco Swivel Joints make it easy to position the piping to (1) Insure Good Drainage, (2) Avoid Interference, and (3) Eliminate the Nuisance of Sagging, Flopping, Non-Rigid Lines. Because they are *self-aligning,* Barco Swivel Joints are easy to install. They cannot blow out unexpectedly. Internal construction automatically takes up for wear and keeps joints tight where there is alternating hot and cold service. No lubrication is required. Barco's new No. 11CTS gaskets greatly reduce torque and insure perfect sealing, regardless of temperature or pressure. Get this advanced performance NOW! Send for complete information on MODERNIZING old joints.

BARCO *Manufacturing Co.*

510E Hough Street, Barrington, Illinois
In Canada: The Holden Co., Ltd.

The only truly complete line of flexible ball, swivel, swing and revolving joints

The only antioxidants that have proved these claims in use!

most active...
most resistant to discoloration

ANTIOXIDANT 2246®

(highest efficiency for general application)

ANTIOXIDANT 425*

(when minimum discoloration is essential)

Rely on products proved in industry use—time and time again.

Only Cyanamid's two great antioxidants have proved their claims in use... month in, month out... acquiring an enviable reputation for performance throughout the industry.

And in the rubber industry, only *performance* counts. You get it—in full measure—from Cyanamid's antioxidants, the only ones proved-in-use to give the best performance, the finest results... *for every antioxidant dollar you spend!*

* Trade-mark

SALES REPRESENTATIVES AND WAREHOUSE STOCKS: Akron Chemical Company, Akron, Ohio • H. M. Royal, Inc., Trenton, N. J. • H. M. Royal, Inc., Los Angeles, Calif. • Ernest Jacoby and Company, Boston, Mass. • Herron & Meyer of Chicago, Chicago, Ill. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto.

Calco®

AMERICAN Cyanamid COMPANY

INTERMEDIATE & RUBBER CHEMICALS DEPARTMENT

BOUND BROOK, NEW JERSEY

speaking of operations...

Let us tell you about *our* operation—a small section of which is shown above. It's the world's largest operation of a complex inorganic chemical process—the manufacture of TITANOX white pigments at Sayreville, N. J.

Bigness is essential in our business for two reasons. First, to keep ahead of your increasing demand for titanium dioxide white pigments in new and established uses. Second, to maintain your preference for TITANOX white pigments—a preference created by TITANOX quality, service and uniformity.

These are two reasons why more TITANOX titanium pigments are sold than all other brands combined. And they're the reasons why so many different industries have discovered that TITANOX is *first choice in white pigments.* Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Atlanta 2; Boston 6; Chicago 3; Cleveland 15; Houston 2; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 14, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

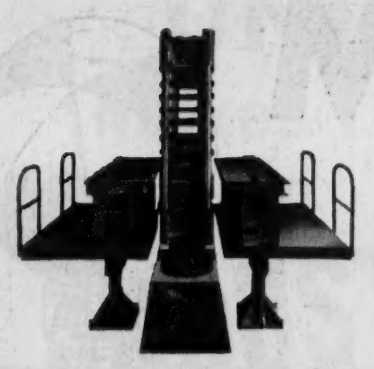
2815-A

®TITANOX

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

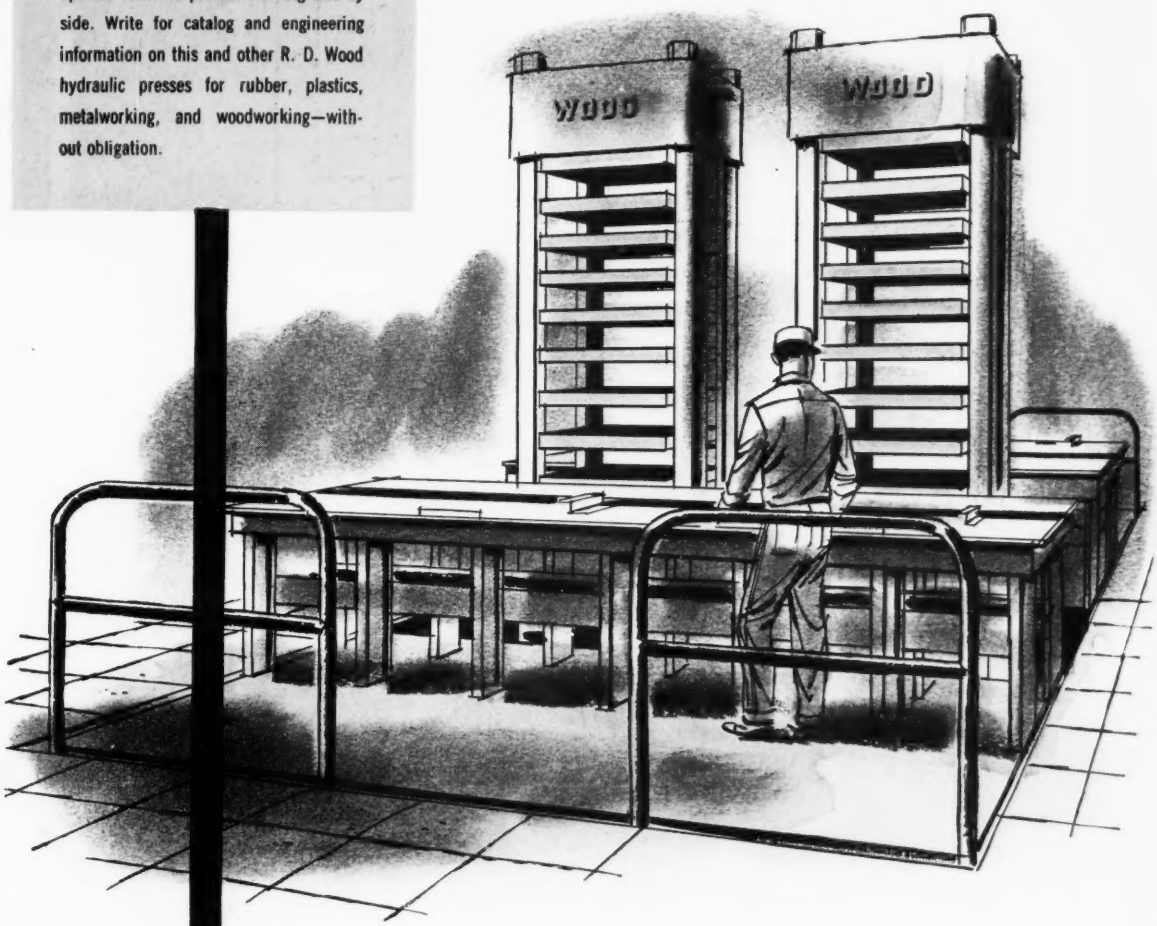
Subsidiary of NATIONAL LEAD COMPANY



192-ton Multiple Opening Platen Press. Designed for molding rubber products. This press may be operated from an individual self-contained pumping unit or a central accumulator system. Two elevators operate with two presses working side by side. Write for catalog and engineering information on this and other R. D. Wood hydraulic presses for rubber, plastics, metalworking, and woodworking—without obligation.

The nameplate is your guarantee of value

When you buy an R. D. Wood press, you can take *full value* for granted. In more than 150 years, the R. D. Wood nameplate has never appeared on a product of inferior quality. It is your guarantee of sound design, premium materials, superlative craftsmanship. It is your assurance also of smooth, trouble-free performance, high productivity, long life and production economies.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

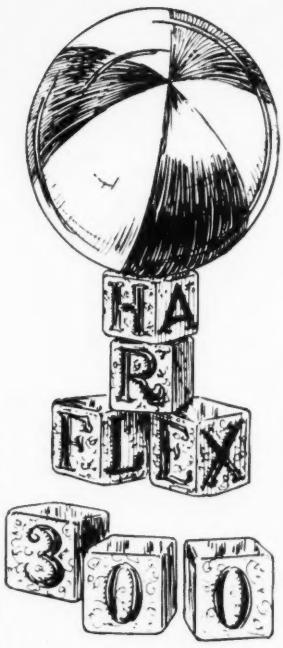
Representatives in Principal Cities

MAKERS OF HYDRAULIC PRESSES AND VALVES • FIRE HYDRANTS • CAST-IRON PIPE • GATE VALVES • GAS PRODUCERS • ACCUMULATORS

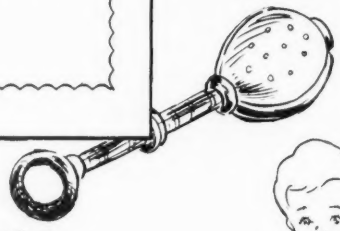
HARCHEM

Announces

THE BIRTH OF —



HARFLEX® 300



. . . A **true** Polymeric . . . non-migratory plasticizer . . . with the lowest temperature flexibility obtainable.

Ideally adapted to applications where permanence and low cold-flex are essential to your finished products. Send for sample.

SEBACATES PHTHALATES ADIPATES

BINNEY & SMITH CO. • Distributor to the Rubber Industry

HARCHEM

25 MAIN ST., BELLEVILLE 9, NEW JERSEY

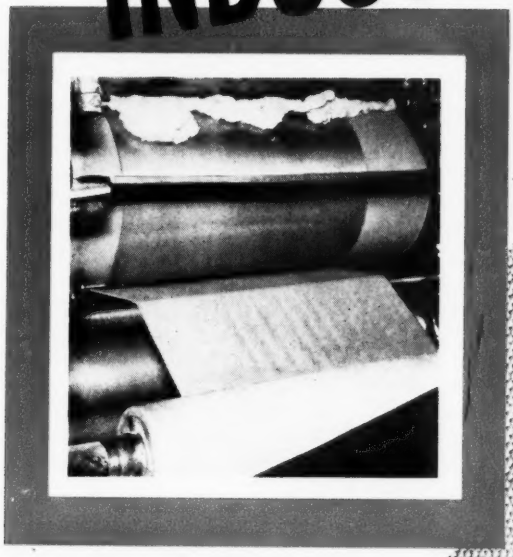
THE KEY TO HARCHEM® BETTER PLASTICS

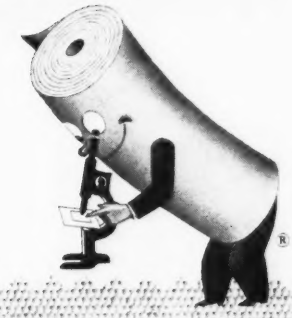
HARCHEM DIVISION
WALLACE & TIERNAN, INC.

Manufacturers of Sebacic Acid

Canadian Distributor: W. C. Hardesty Co. of Canada Ltd., 975 Lakeshore Road, New Toronto, Canada H-1

UNIFORMITY
Makes The Big Difference In
INDUSTRIAL FABRICS





MT. VERNON FABRICS Give You Greater Uniformity

Checking evenness of sliver with linear regularity tester. One of a series of laboratory controls throughout production to assure fabric uniformity in all Mt. Vernon-Woodberry products.

Mt. Vernon-Woodberry Mills

TURNER HALSEY COMPANY
Selling Agents

Main Office: 40 Worth St., New York
Branch Offices: Chicago • Atlanta
Baltimore • Boston • Los Angeles

FABRICS ENGINEERED TO FIT YOUR NEEDS

Need adaptation of an existing fabric to your special purposes? Or creation of an entirely NEW fabric—cotton, synthetic or blend – to meet your specifications? Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

INTEGRATED SERVICE

MACHINERY & EQUIPMENT
PLANT DESIGN & LAYOUT
PROCESS ENGINEERING
RAW MATERIAL SOURCES

FOR RUBBER
PLASTICS
CHEMICALS

CONTINENTAL MACHINERY COMPANY, INC.

AND ASSOCIATED ENGINEERS AND ARCHITECTS
261 BROADWAY, NEW YORK

Telephone WOrth 2-1650

CABLE—"CONTIMAC" NEW YORK

"ON THE BEAM" ADHESION

For Bonding RUBBER - TO - METAL in Electronic Equipment

TY·PLY® NEW UP - RC

BOND IS UNAFFECTED BY EXPOSURE TO OZONE

TY-PLY "UP" . . . the new Universal Primer and TY-PLY "RC" . . . the improved Rubber Cover Cement are exceptionally suitable for natural rubber stocks (both normal and low-sulfur), standard and cold-polymerized GR-S's, polybutadiene, oil-modified GR-S, arctic-type GR-S and natural-GR-S blends. Both adhesives have excellent shelf and working stability; are insensitive to weather or ozone conditions; and work well over a wide range of curing temperatures.

TY-PLY "Q" or "3640"
for bonding Natural, GR-S, and Butyl

TY-PLY "BN"
for bonding N-types

TY-PLY "S"
for bonding Neoprene

TY-PLY will adhere most vulcanizable rubber compounds to almost any clean metal surface

Marbon

MARBON CHEMICAL
Division of BORG-WARNER
GARY, INDIANA

TY-PLY has stood the test of time . . . since '39

DETROIT PUBLIC LIBRARY

Photo of St. Joe surface-treated Zinc Oxide in pellet form, actual size.

PELLETIZED ZnO NORMAL ZnO

(Note reduction in storage space required)

THE ST. JOSEPH LEAD COMPANY is now ready to ship ST. JOE surface-treated ZINC OXIDE in pellet form to consumers in the rubber industry. This "new look" in our product has been worked out successfully with a number of our customers. They have adopted it for all their shipments because – after repeated factory tests – the use of ST. JOE surface-treated ZINC OXIDE in the new pellet form was found to offer the consumer these definite advantages:

- *Free-flowing—improved handling properties*
- *Freedom from dustiness—better plant housekeeping*
- *Faster incorporation in rubber*
- *Superior dispersion in rubber*
- *Less storage space required owing to 50% increase in apparent density*

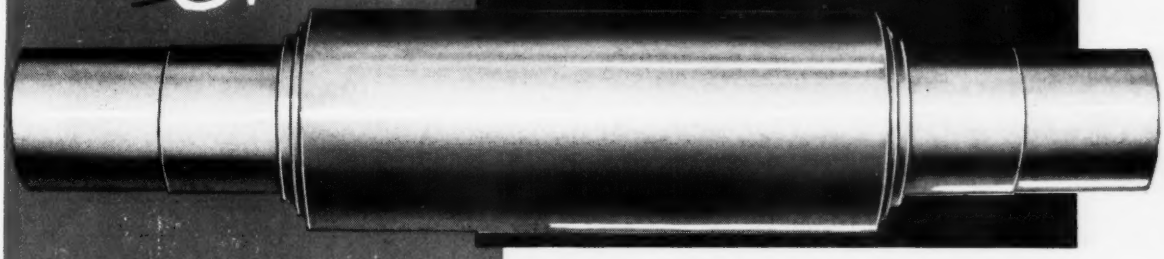
For your next shipment, specify ST. JOE surface-treated ZINC OXIDE in PELLET FORM

ST. JOSEPH LEAD COMPANY

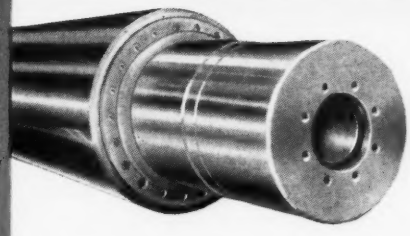
250 PARK AVENUE, NEW YORK 17 ***Plant & Laboratory, Monaca (Josephtown) Pa.***

Where
UNIFORMITY
PRECISION
DEPENDABILITY
are factors . . . .
Specify

UNITED®
DRILLED-TYPE ROLLS



for the precision calendering of
PLASTICS
RUBBER
TILE
LINOLEUM
or any materials requiring close heat control



Our more than 50 years experience in the design and manufacture of rolls can be helpful in solving your processing problems. Your inquiry is solicited.

UNITED Precision Ground, DRILLED-TYPE ROLLS, the result of careful metallurgical control over raw materials, and of strict quality control in every phase of manufacture . . .

MAINTAIN A UNIFORM ROLL SURFACE TEMPERATURE throughout, with minimum deviation at any point.

ASSURE FULL RANGE HEATING and cooling over wide temperature ranges.

PROVIDE ACCURATE, QUICKLY RESPONSIVE TEMPERATURE CONTROL.

UTILIZE FULL ROLL FACE with new, ring closure type designs.

PERMIT ADJUSTMENT OF RING CLOSURE GASKET AND BOLTS, WITH ROLL IN PLACE in calender or mill, thus eliminating production downtime due to roll removal.

MAINTAIN CORRECT DEPTH OF CHILL for iron or alloy iron rolls.

ARE ENGINEERED AND DESIGNED FOR MAXIMUM HEAT TRANSFER RATE with accurately drilled, fluid passages.

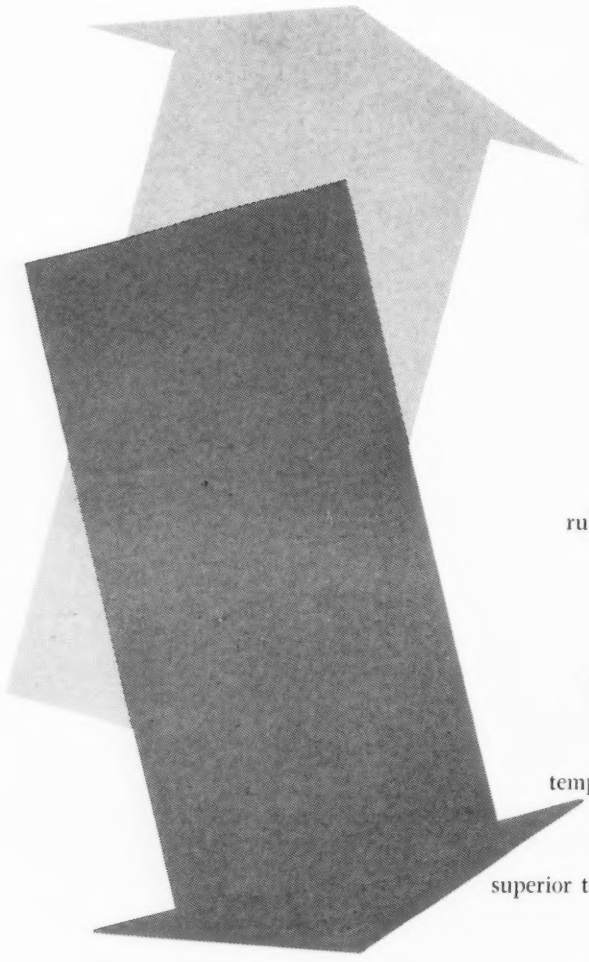
UNITED

ENGINEERING AND FOUNDRY COMPANY
PITTSBURGH, PENNSYLVANIA

Plants at • Pittsburgh • Vandergrift • Youngstown • Canton • Wilmington (Lobdell United Division)
SUBSIDIARIES: Adamson United Company, Akron, Ohio
Stedman Foundry and Machine Company, Inc., Aurora, Indiana

Designers and Builders of Ferrous and Non-Ferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

now a LOW COST plasticizer that improves NEOPRENE qualities



Recently concluded tests indicate that Drapex 3.2 is outstanding for use as a low temperature plasticizer for Neoprene rubber, adding superior properties at a lower cost than conventional low temperature plasticizers.

The low temperature impact resistance of Neoprene stocks plasticized with Drapex 3.2 is equivalent to that obtained with DOS.

Drapex 3.2 is among the least volatile of the low temperature plasticizers, and has a low specific gravity. Its use in Neoprene stocks adds outstanding resistance to extraction or swelling by oil . . . far superior to any plasticizer tested. Drapex 3.2 will make your Neoprene products last longer.

DRAPEX 3.2

LOW TEMPERATURE EPOXY PLASTICIZER

Added to all of the above advantages is the fact that Drapex 3.2 is among the least costly of the low temperature plasticizers. Why not test Drapex 3.2 in your Neoprene stock? Write today for a generous working sample and our Neoprene Data sheet.

ARGUS CHEMICAL CORPORATION

633 COURT STREET BROOKLYN 31, N. Y.

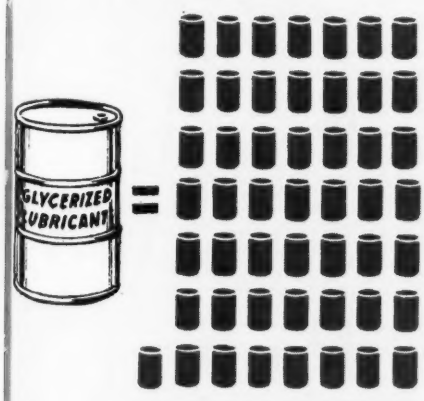
NO PUZZLE!

when you use GLYCERIZED (LIQUID CONCENTRATE) LUBRICANT

ECONOMICAL? *Here's Why...*

HIGHLY CONCENTRATED

1 drum makes up to 50 drums of working solution



THE ALL PURPOSE EXTERNAL LUBRICANT

NATURAL SYNTHETIC AND RECLAIM STOCKS

DOES NOT INTERFERE WITH TACK OR KNIT

Prevents adhesion of hot rubber slabs when piled . . . banishes dust nuisance by replacing soapstone or talc . . . prevents sticking during cure of extrusions and flat pan coiled tubing . . . excellent release agent for molds, mandrels, air bags, belt drums . . . equally satisfactory for washing and finishing inner tubes; imparts satiny finish . . . greatly aids in the processing of insulated wire and cable. The Production Departments and Laboratories of many rubber manufacturers, through years of using GLYCERIZED, give ample proof of its outstanding qualities as a lubricant for natural, synthetic and reclaimed stocks.

Also Mfgrs. of

RUBBEROL AND SYNTHOL

TWO OTHER FACTORY PROVED RUBBER PROCESSING AGENTS

QUALITY SINCE 1884

GENSEKE BROTHERS

RUBBER MATERIALS DIVISION

West 48th Place and Whipple Street Chicago 32, U.S.A.

Chlorowax®

makes rubber products fire retardant

Chlorowax has been used extensively for adding fire-retardant qualities to rubber, paint, plastics, and other ordinarily combustible materials. Our technical staff has co-operated in many of these successful developments and will be glad to work with you.

Besides adding fire retardance, Chlorowax 70 can provide these additional benefits:

Reinforces GR-S, nitrile and neoprene polymers. Light color also makes it ideal for reinforcing white rubber stocks.

Plasticizer at rubber processing temperatures. Aids processing characteristics without bloom or exudation from the surface.

Aids faster incorporation of high pigment loadings. Chlorowax 40 functions effectively as a nonflammable rubber plasticizer.

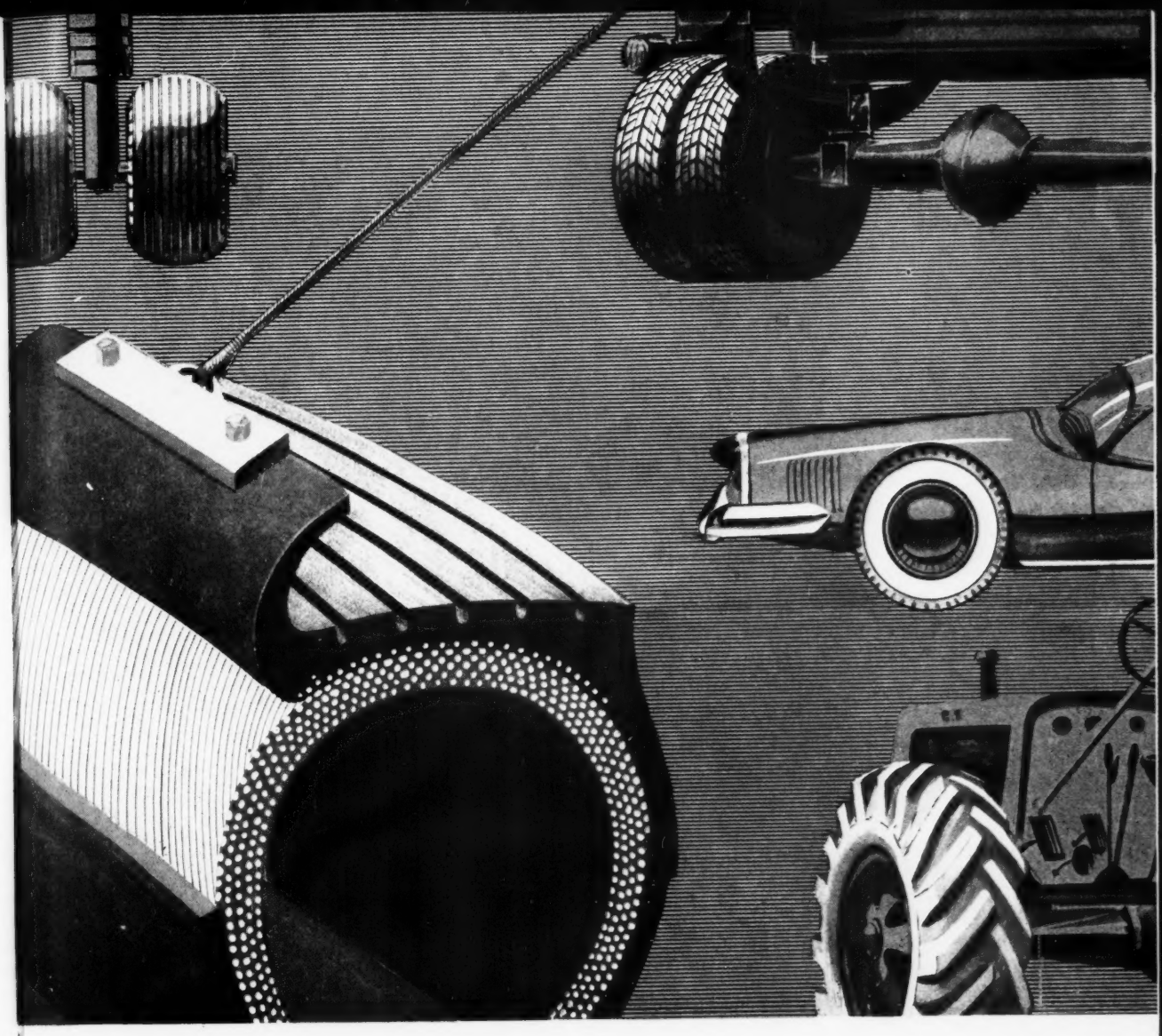
For more facts on Chlorowax, write for new bulletin, *Chlorowax in Flame Retardant Rubber Compounds.* DIAMOND ALKALI COMPANY, Chlorinated Products Division, 300 Union Commerce Building, Cleveland 14, Ohio.

CHARACTERISTICS

	CHLOROWAX 70 (solid resin)	CHLOROWAX 40 (liquid)
Melting point	95-110 C	—
Particle size	90% through 50 mesh	—
Solubility in water	Insoluble	Insoluble
Toxicity	Non-toxic	Non-toxic
Odor	None	None
Chlorine content (%)	68-73	40-42
Viscosity (poises at 25 C)		20-28
Evaporation rate (gm per sq cm per hr at 100 C)	0.000004	

DIAMOND ALKALI CHEMICALS®

Diamond Chemicals



Pyratex makes cord and carcass ONE...for life

New Pyratex—a specially developed vinyl pyridine latex for tire cord treatment—greatly increases cord-to-carcass adhesion and reduces bond fatigue and ply separation.

Try Pyratex in your own stocks—for tires, drive belts, conveyor belts—wherever you need a permanent rubber-to-fabric bond.

To learn more about Pyratex—developed by the same company that brought you the first natural latex for tire cord treatment, the first reclaim dispersion, and GR-S plus Resorcinal—simply write on your letterhead to the address below.

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.

good impressions
Shaw-McNeil Bag-o-matic Presses have certainly made *their* mark in the rubber industry. We have ample proof that these presses have, for many years, been making good impressions throughout the world. The 450-55-160 Tilt Back Press shown here, handles all sizes of car and truck tyres between 750 x 20 and 1200 x 20. The steam domes are integral with the press, and the cured tyres are automatically stripped from their moulds. Safety devices are incorporated which prevent the press opening until the air-bag is empty. Shaw-McNeil Tyre Presses are supplied ready for immediate connection to your air, steam and electrical supply lines. Bag-o-matic Presses are also available for the production of cycle and passenger tyres.
machinery for tyre and tube production
SHAW
FRANCIS SHAW & CO., LTD., MANCHESTER 11, ENGLAND
Telephone: East 1415-8. Grams: Calender Manchester.
Enquiries to FRANCIS SHAW (CANADA) LTD.
Graham's Lane, Burlington, Ontario, Canada

HI-SIL 233 ®

Hi-Sil 233 is Columbia-Southern's new high quality reinforcing silica that brings new economies in non-black formulations.

Production has been expanded to permit immediate shipment. You are invited to place your order now, or if you have not obtained your experimental working samples, write today to our Pittsburgh office.

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES OF HI-SIL 233

Bulk density	10 lbs./cu. ft.
Specific gravity	1.95
Average Particle Size	0.022 micron
Color	White
Refractive index	1.46
Oil Absorption (Rub-in Method)	170 gm. oil/100 gm.
Surface Area	150 sq. m./gm.
pH in 5% Water Suspension	7.3
Loss at 105° C.	5%
Total Loss on Ignition at 1200° C.	10%
SiO_2	87%
CaO	0.5%
Fe_2O_3	0.2%
Al_2O_3	0.6%
NaCl	1.0%

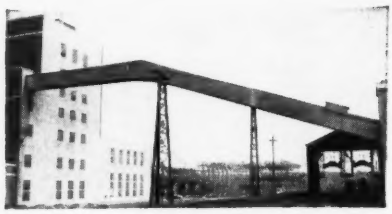
Packaging—50 pound multiwall paper bags.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

CHEMICAL PROGRESS WEEK-MAY 16-21
A BETTER AMERICA THROUGH CHEMICAL PROGRESS

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York
St. Louis • Minneapolis • New Orleans • Dallas • Houston • Pittsburgh • Philadelphia • San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division
(Pigment warehouse stocks at Montreal and Toronto)

Fabric helps boost coal —to power



Enclosed Hewitt-Robins conveyor belt at Duke Power Company's Lee Steam Station, Pelzer, S. C.

Problem: Boosting a half million tons of coal yearly 365 feet from ground level to bunkers 82 feet high at the Lee Steam Station of Duke Power.

A 36-inch wide conveyor belt was—and is—the answer. Because of the load and inclination, unusual tension develops in the belt. By using a specially constructed Wellington Sears "Shawmut" belt duck, Hewitt-Robins' engineers designed a 763-foot belt that withstands the tension successfully, performs with outstanding efficiency.

This belting has to be extraordinarily strong and durable. It is—carrying up to 500 tons of coal an hour, 425 feet a minute. Indeed, since stoppage would shut the Station down within a matter of hours, the belt is guaranteed by the manufacturer not to stretch excessively and thereby require re-splicing. It has not. Since installation in 1950, it has run seven days a week without being stopped for repairs.

This belting also conveys a basic idea. Wellington Sears has blue-printed fabrics for industrial progress for over a century. Whatever your fabric need, cotton or synthetic—for coating or impregnation—unparalleled experience and equipment are at your service. Write us for illustrated booklet, "Modern Textiles for Industry."

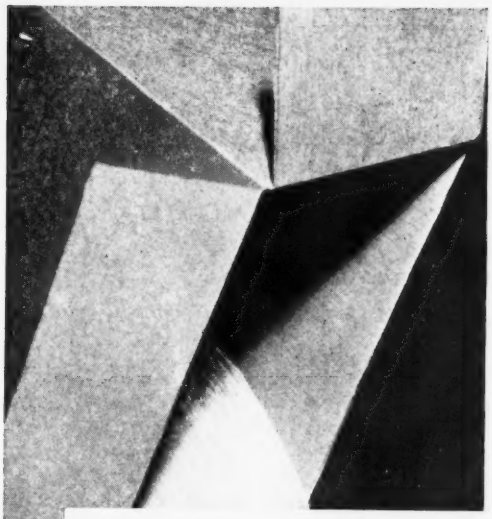
Wellington Sears

A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

For Mechanical Goods, Coated Materials, Tires, Footwear and Other Rubber Products

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis



* it's beaded it pours!

a NEW development in the rubber industry

DETERO WAX

SPECIALLY DESIGNED Wax *to PROTECT RUBBER*

- BEADED WAX makes measuring and handling easier.
- Cuts working time—Cuts cost!
- Disperses easily and uniformly.
- Insures a film of good pliability and maximum durability.
- Blooms uniformly in hot or cold weather.
- Gives maximum ozone resistance.
- Various grades available to suit every wax requirement in the RUBBER and PLASTICS industry.

MANUFACTURERS, TECHNOLOGISTS *SPECIFY* . . . DETERO WAX

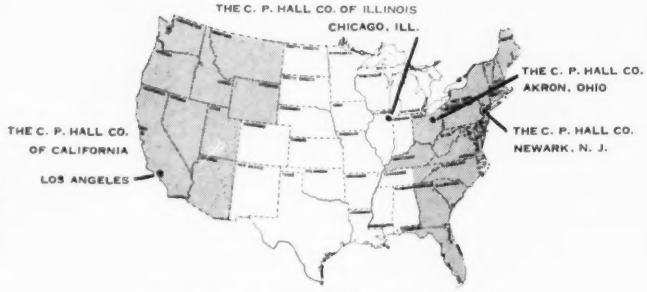
Detailed information and samples on request.
Inquiries answered immediately without obligation.

***RUBBER'S BEST FRIEND**

*Process patent applied for

a product of .. **American Maintenance Supply Co.**
236 W. NORTH AVE.—CHICAGO 10, ILL.

It was in April of 1945—just 10 years ago, that The C. P. Hall Co. opened its Illinois plant in Chicago, to serve the Central & Southern states. In this 10th Anniversary year, our record reflects the loyalty of the many customers who have come to count on The C. P. Hall Co. for quality chemicals. From our start in 1919, with one small office, The C. P. Hall Company has steadily grown to serve *your needs* with 4 modern plants from coast to coast. We sincerely appreciate your patronage through the years and reassure you that you may continue to look to The C. P. Hall Company for products capable of even GREATER results for industry in the years ahead.



The C. P. Hall Company of Illinois serves the entire area shown by the white portion of this map.

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

AKRON, OHIO • LOS ANGELES, CALIF. • CHICAGO, ILL. • NEWARK, N. J.

SULPHUR IS PROCESSED BY STAUFFER FOR THE RUBBER INDUSTRY

Offering special sulphurs to the rubber industry for over three decades, the Stauffer Chemical Company has developed a complete line to meet all demands. Carefully screened Stauffer sulphurs are available in a wide variety of mesh sizes for every rubber recipe. In addition, there are surface conditioned grades designed for special blending problems.

Tire Brand is a commercial powdered sulphur for general vulcanization purposes.

Tube Brand is a refined sulphur with a 99.8% purity to meet special or more exacting requirements.

Special Flowers of Sulphur is a 30% insoluble sublimed sulphur, economical where a degree of rubber insolubility is required.

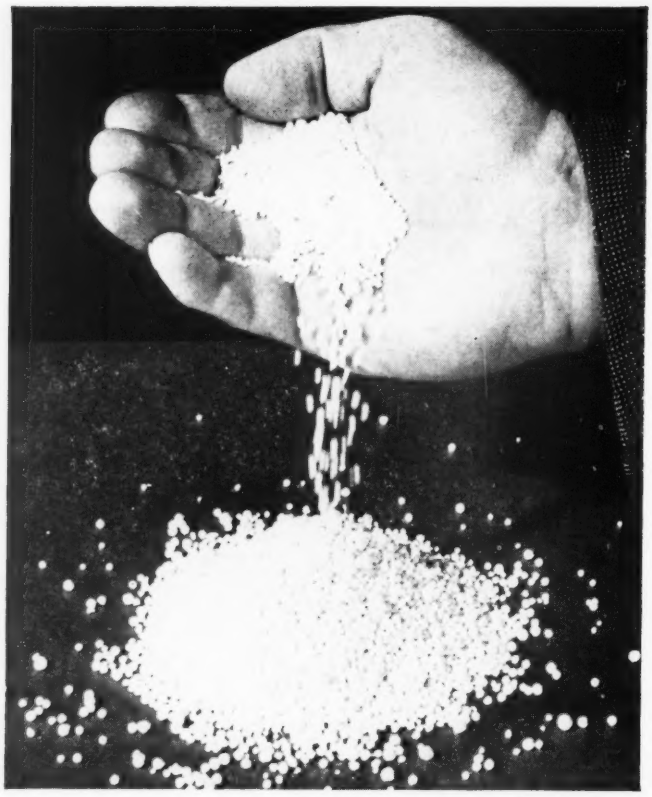
Crystex is a unique allotrope of sulphur, 85% insoluble in rubber or rubber solvents. It is used to prevent pre-vulcanization sulphur 'bloom'.

Rubber tracks for Army tanks

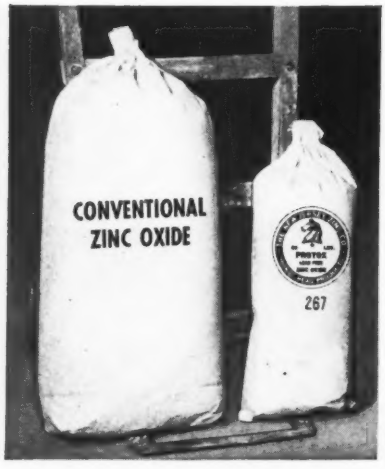
380 MADISON AVENUE, NEW YORK 17, N. Y.

221 N. LaSalle Street, Chicago 1, Illinois · 636 California Street, San Francisco 8, California
326 S. Main Street, Akron 8, Ohio · 824 Wilshire Boulevard, Los Angeles 14, Calif.
8901 Hempstead Road, Houston 8, Texas · North Portland, Ore.

STAUFFER Stauffer CHEMICALS SINCE 1885 CHEMICALS



PELLETED PROTOX-267
...Cuts Unloading Costs up to 33%



You can make substantial savings in handling Protox-267* zinc oxide as compared with conventional oxides, whether you use manual or mechanical methods.

1. MANUAL UNLOADING

You can load on each handtruck or pallet up to 3 times as much Protox-267 because its bags are more compact. That means fewer trips from car to storage—thus faster, lower-cost unloading.

2. FORK-TRUCK UNLOADING

You can save up to $30 on unloading each 36-ton car of Protox-267 when you handle its convenient unit loads mechanically rather than by hand.

You will find Protox-267 also cuts your storage costs and processing costs.

Protox-267 bags weigh the conventional 50 pounds, but are smaller and more convenient to handle due to low dry bulking of the oxide.

*U. S. Patents 2,303,329 and 2,303,330

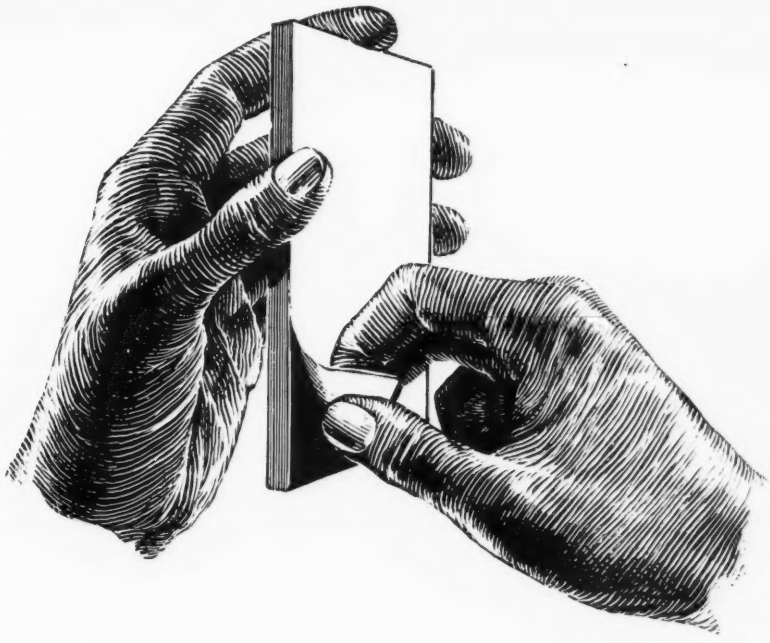
THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

... most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS



hands you never see
give *your pressure sensitive cement* the test that really counts

Got a product that requires mechanical or adhesive installations or applications? Then by all means explore the possibilities of new *pressure sensitive cements!* But remember this:

Hands you never see . . . the hands of the eventual product user . . . give your pressure sensitive cement the test that really counts. So look for *experience* with this new adhesive medium . . . experience that goes beyond the laboratory into the field of use.

As adhesive manufacturers for over 20 years, and pioneers in the pressure sensitive field, we already have some unusual success stories to tell. Let's talk about how they might be applied to your product.

Call or write Dept. C at the nearest Angier Plant for personal attention. We will help you define your problem as well as solve it. Inquiring will not obligate you in any way.

FOR EVERY INDUSTRY

Latest Developments in Pressure Sensitive Cements

ANGIER PRODUCTS INC.

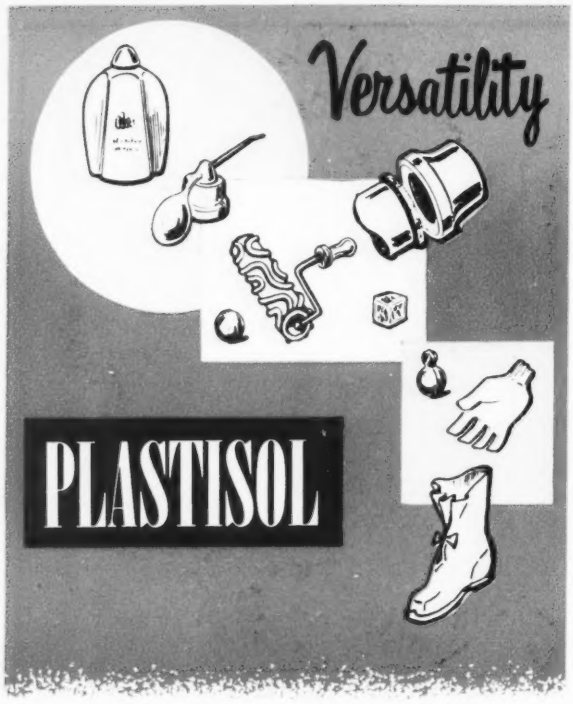
Rubber, Latex and Resin Cements
Laminants and Sealants
Tie Coats
Resin Emulsions

Angier Products

120 POTTER STREET, CAMBRIDGE 42, MASS.

Midwestern Plant: Huntington, Indiana

© 1955 Angier Products, Inc.



The soft, rubber-like characteristics of plastisols lend themselves to many applications:

1. In the creation of a new product.
2. As an improved material for a current product.

The toughness, chemical resistance, wear resistance, tear strength and permanent flexibility make these compounds outstanding as noise deadeners, wire coatings, flexible molded parts, textile coatings, sealing compounds, glove coatings and in many other applications.

If your product requires a soft plastic coating or a molded part, you should consider the use of vinyl plastisols.

"Best Known Name In Plastisol"

Watson-Standard Co.

225 Galveston Ave., Pittsburgh 30, Pa.

NEW YORK OFFICE: 15 Park Row, New York 38, N. Y.
CHICAGO OFFICE: 55 E. Washington Street, Chicago 2, Ill.

PLASTICS • INDUSTRIAL FINISHES • CHEMICALS

THE INSTITUTION OF THE RUBBER INDUSTRY

The Institution of the Rubber Industry

LONDON

The I.R.I., which was founded in 1921, is now a great association of people engaged in all branches of the Rubber Industry. Its members include rubber producers, manufacturers, scientists, technologists, executives, students and others, in many countries of the world.

It has reached its present position of authority and respect through the high standard it has set for the technical literature it publishes, the diplomas it awards, and the meetings and conferences it organizes.

In collaboration with other Societies, it aims to raise the standing of the Industry throughout the world by improving the technical qualifications of its personnel, extending the study of its raw materials, processes, and products, and by promoting the exchange of technical discovery and information by means of literature, conferences, and meetings.

Membership of the Institution is open to all interested at an annual subscription of $7.50 which entitles the member to receive the bimonthly Transactions free of charge and to purchase other publications (such as the Annual Reports and Monographs) at reduced rates. It also serves to put him in touch with his colleagues and their work in other parts of the world and confers on him full rights to vote, to nomination for election to the Council and to participate in meetings and Conferences organized by the Institution.

Complete details are easily obtained by writing to:

SECRETARY
INSTITUTION OF THE RUBBER INDUSTRY
12, WHITEHALL
LONDON, S.W. 1, ENGLAND

HEXANETRIOL-1,2,6

$$HO\text{-}CH_2\underset{\displaystyle OH}{\underset{|}{C}}HCH_2CH_2CH_2CH_2OH$$

The three hydroxyl groups of hexanetriol-1, 2, 6 are readily esterified under normal cooking conditions. Alone or in combination with other polyols, hexanetriol-1, 2, 6 reacts with dibasic acids to make polyester resins and alkyd resins with greater flexibility and increased compatibility with other resins. Hexanetriol-1, 2, 6 offers a new approach to the manufacture of polyurethane resins and isocyanate foams. Because of its configuration, limited hygroscopicity (about 40 per cent of glycerol), and solvent properties, it is effective as a humectant-plasticizer for water-dispersible resins. Hexanetriol-1, 2, 6 is now available in commercial quantities. Order now and put this valuable triol to work for you.

PROPERTIES OF HEXANETRIOL-1,2,6

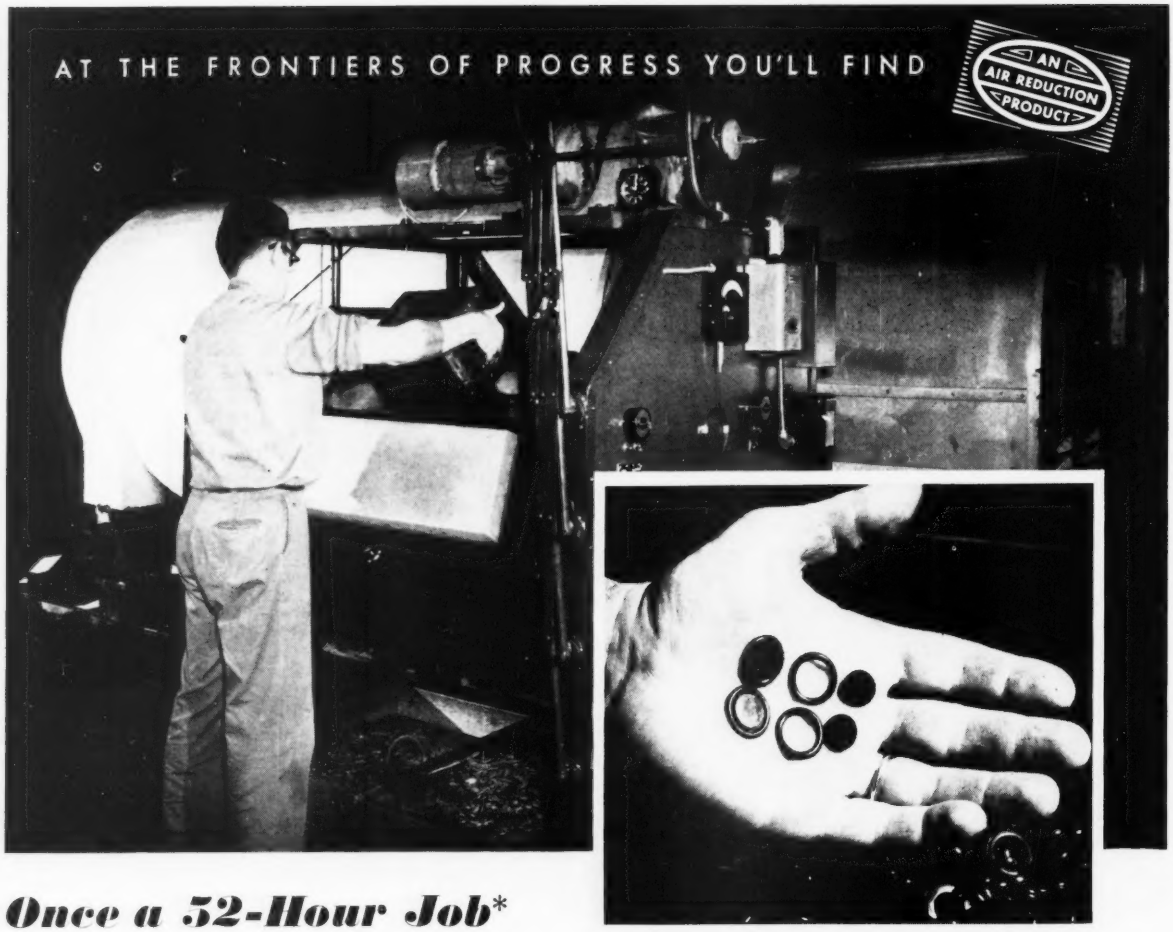
Specific Gravity at 20/20°C.	*1.1063*
Boiling Point at 5mm. Hg	*178°C.*
Vapor Pressure at 20°C.	*< 0.01 mm. Hg*
Freezing Point	*Sets to a glass below -20°C.*
Solubility in Water at 20°C.	*Complete*
Viscosity at 20°C.	*2584 cps.*
at 40°C.	*512 cps.*

For Further Information

. . . write the CARBIDE Office nearest you for the technical bulletin on Triols (F-7779). CARBIDE also supplies pentanediol-1, 5 and 23 other glycols and polyglycols. In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Toronto.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.



*Once a 52-Hour Job**

NOW IT'S DONE IN 20 MINUTES!

*It used to take as much as 52 hours to deflash the small rubber valve discs shown. The same job done better by tumbling with Pureco liquid CO_2 takes only 20 minutes for flash-free results.

Here is a process that means greater profits for you . . . much lower labor costs . . . fewer rejects . . . gentler handling of delicate parts . . . and greater adaptability.

While rubber tumbling may not be new to you, the Pureco man may be able to help you improve your techniques, enable you to tumble a far greater variety of parts. Ask him to call. He'll be glad to take your "problem" parts to our laboratory experts for a full confidential report on the method of tumbling that is best for you—and, of course, at no obligation.

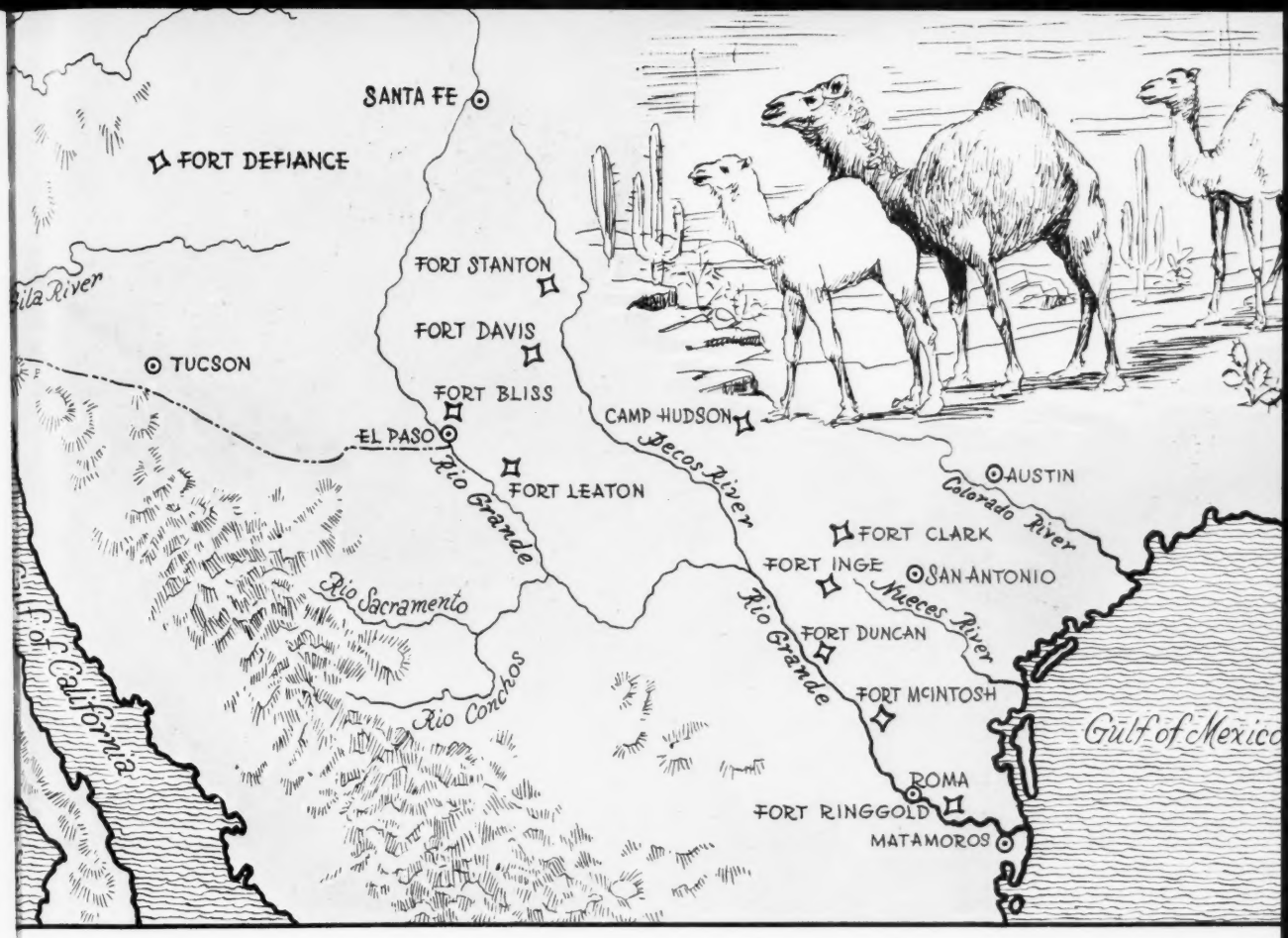
PURECO

Pure Carbonic Company

NATION-WIDE "DRY-ICE" SERVICE-DISTRIBUTING STATIONS IN PRINCIPAL CITIES

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, NEW YORK

PURE CARBONIC COMPANY *is a division of* **AIR REDUCTION COMPANY, INCORPORATED** *Principal products of other divisions include:* **AIRCO**—*industrial gases, welding and cutting equipment and acetylenic chemicals* **OHIO**—*medical gases and hospital equipment* **NATIONAL CARBIDE**—*pipeline acetylene and calcium carbide* **COLTON**—*polyvinyl acetates, alcohols and other synthetic resins.*



The Army's Camel Caravan

In May 1856, there arrived at Indianola on the Gulf of Mexico a shipment from Smyrna consisting of "a drove of camels, 34 in number." There were Tunis, Bactrian and Booghdee camels; Senaar, Siout and Mount Sinai dromedaries — males, females and calves. The Inspector General of the Army observed that these animals were "designed by the Creator for beasts of burden," but only an actual trial would show if they were adapted for transporting supplies over the vast, waterless southwest.

The Army faced a real problem in supplying its forts and posts in the Rio Grande area. The head of navigation on the Great River was at Roma, about 150 miles from the Gulf. Wagon and pack horses were being used for the transshipment of supplies. Warlike Indians were everywhere — Comanches, Apaches and Navajo.

The War Between the States covered the camel experiment with oblivion and little remains of what was actually accomplished by the 34 ships of the desert except, of course, for tall tales according to which phantom-like camels are still to be seen roaming the mysterious distances of the southwest to this day.

.....

The wide foot of the camel, the shod foot of pack mules and horses, the iron rim of the wagon wheel, the solid wheel of the Mexican caretta — the Southwest has seen all of these as man has tried to find better and faster transportation over its sandy ground and rocky stretches.

Today, however, man and his products go quickly and surely over roads good and bad, through populated areas, and through the wild places. At long last man has found the source of rapid movement — the rubber tire.

This rubber tire, so long sought for, through the ingenuity and skill of the tire manufacturer, is constantly improved. *Carbon black imparts the needed durability and longevity. UNITED BLACKS are in the forefront because they, too, are the product of advanced research and skill.*

UNITED CARBON COMPANY, INC.

Kosmos 70 is foremost among ISAF (intermediate super-abrasion furnace) carbon blacks. It is the invariable choice of discerning compounders for tubeless tires, premium tires and first line quality tires.

Kosmos 70 is expertly made by masters in carbon black manufacture to satisfy the most exacting specifications of tire makers who insist on the best.

Kosmos 70 is today's black for today's needs and is dependable for exceptional performance and unblemished service.

There are Kosmos Blacks for practically every purpose. They will help you stay ahead.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, WEST VIRGINIA

NEW YORK AKRON CHICAGO BOSTON MEMPHIS

HOW FARREL-BIRMINGHAM CAN *BLUEPRINT* YOUR WAY TO INCREASED PRODUCTION EFFICIENCY

The Farrel-Birmingham Engineering Planning Division can benefit you in two ways. Provide you with a layout that will help you cash in on the potential of existing equipment, or devise the ideal setup for your particular production aims.

A layout is composed of production machines matched in capacity to prevent "choking or starving" of succeeding units. Production flows without costly interruption. Manual aid and supervision are cut to a minimum.

Farrel-Birmingham designs these layouts to meet widely varying physical and economic requirements. Our engineers will work with your engineers to help you select the right system for your needs.

Send for details of processing setups, and ask for information about any of the production units listed below.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

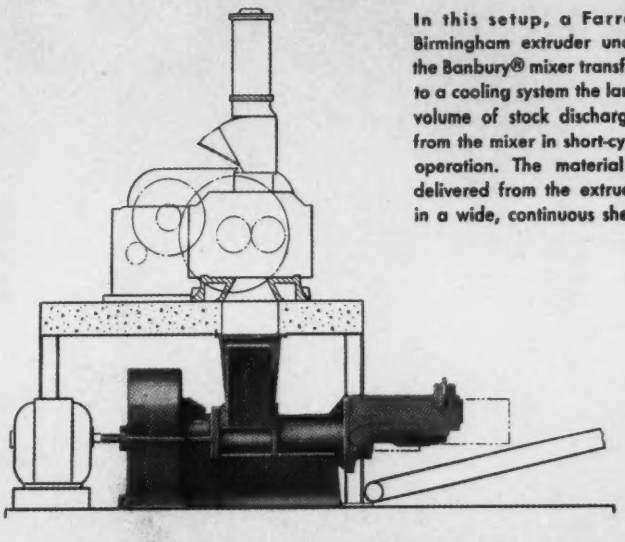
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Fayetteville (N. C.), Los Angeles, Houston

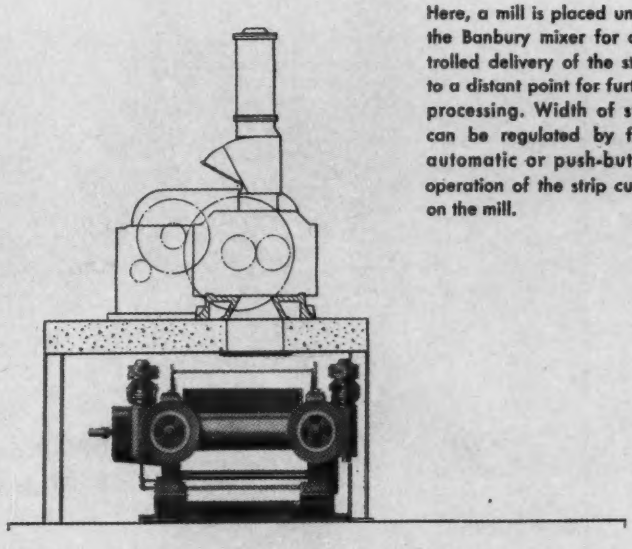
FB-999

F-B PRODUCTION UNITS

Banbury Mixers • Plasticators • Pelletizers • Extruders • Calenders • Mixing, Grinding, Warming and Sheeting Mills • Refiners • Crackers • Washers • Hose Machines • Bale Cutters • Hydraulic Presses and Other Equipment for Processing Rubber and Plastic Materials.

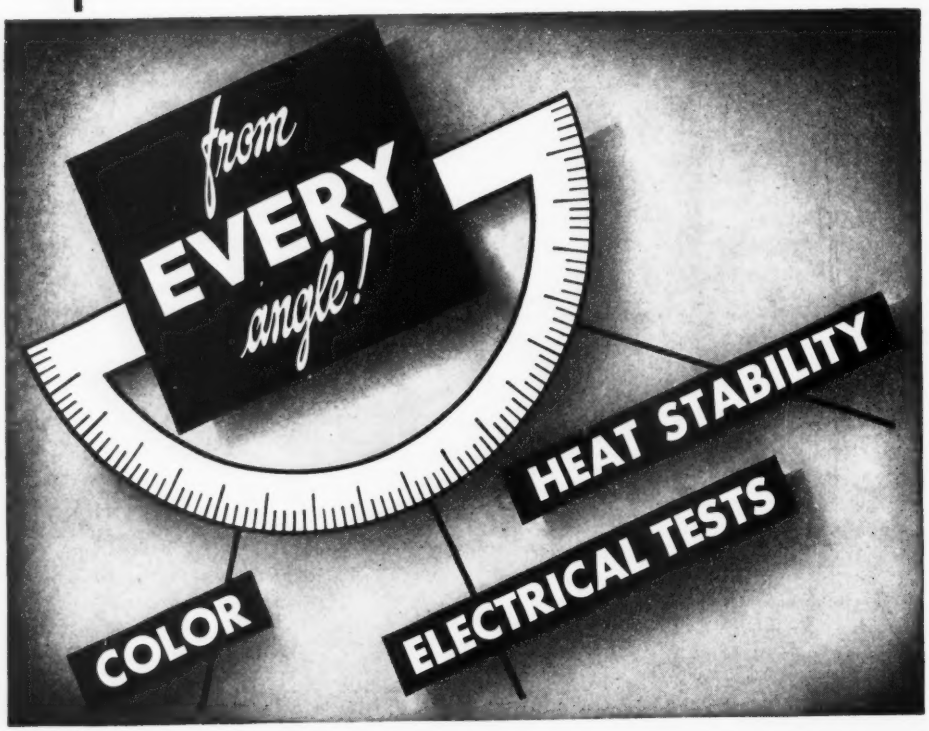


In this setup, a Farrel-Birmingham extruder under the Banbury® mixer transfers to a cooling system the large volume of stock discharged from the mixer in short-cycle operation. The material is delivered from the extruder in a wide, continuous sheet.



Here, a mill is placed under the Banbury mixer for controlled delivery of the stock to a distant point for further processing. Width of strip can be regulated by fully automatic or push-button operation of the strip cutter on the mill.

Farrel-Birmingham®



PIGMENT NO. 33

for Compounding

VINYLS AND SYNTHETIC RUBBER

Sample and technical data sent promptly on request

SOUTHERN CLAYS, Inc.

33 RECTOR STREET
NEW YORK 6, N. Y.

RELIABLE ZINC OXIDES

AZO-ZZZ-44 and AZO-ZZZ-55 assure good dispersion and easy processing because of their uniform particle size and absence of extreme fines. With AZO-ZZZ-11, 22, 33, (Acicular types) and special grades, a complete range of zinc oxides is offered for every rubber requirement.

A RELIABLE SOURCE

American Zinc assures an uninterrupted supply of zinc oxide. Recent discovery and development of a new, large ore body, added to previous American Zinc reserves, provides sufficient ore to last many years at the current rate of production.

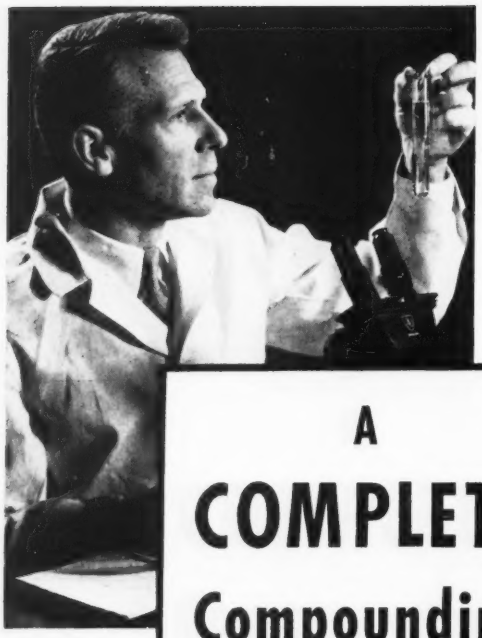
AZO **ZZZ-44**
ZZZ-55

AMERICAN ZINC SALES COMPANY

distributors for

AMERICAN ZINC, LEAD & SMELTING COMPANY

COLUMBUS, OHIO • CHICAGO • ST LOUIS • NEW YORK



A COMPLETE Compounding Service

FOR

EMULSIONS • SOLUTIONS and HOT MELTS . . .

YES, ARCCO offers you a complete compounding service. While offering you a wide range of completed formulations, ARCCO will be glad to develop and compound special formulas to meet your individual needs. All compounds are designed to meet rigid customer specifications based on specified tests in the ARCCO Laboratories.

If you wish greater water, heat or abrasion resistance in air drying or curing formulations, you need only to call for ARCCO Technical Service. Our present available formulations include such specialties as heat seal coatings, plastisols, organosols and laminants for vinyl films.

Whether your business is Textile, Rubber, Leather, Paper, Plastics, Automotive or Chemical, ask for an ARCCO engineer. He will be happy to work with you.

ARCC

AMERICAN RESINOUS CHEMICALS CORPORATION

RESIN EMULSIONS, SOLUTIONS AND HOT MELTS FOR ADHESIVE BASES, BINDERS, COATINGS, SIZES AND SATURANTS

GENERAL OFFICES: *103 FOSTER STREET, PEABODY, MASSACHUSETTS*

IN CANADA: American Resinous Chemicals of Canada, Ltd., Toronto, Canada

Smoother Sailing

WITH EEMCO RUBBER and PLASTICS PROCESSING MACHINERY

MILLS
CRACKERS
WASHERS
REFINERS

★ ★ ★

PRESSES
compression
transfer
fibre glass reinforced plastics

LABORATORY MILLS & PRESSES

EEMCO a leader in RUBBER and PLASTICS MACHINERY

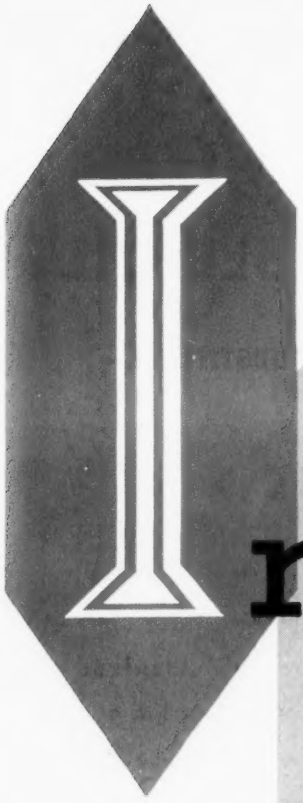
If you are looking for answers to your rubber and plastics equipment problems, you will find them at EEMCO. Yes, they offer smoother sailing on many production problems with the machines which bear the EEMCO trademark. Skillfully designed by qualified engineers—and made by workmen with many years of experience—they offer the utmost in quality, design and workmanship. Serving manufacturers throughout the world, EEMCO rubber and plastics processing machines have proved their worth. EEMCO has its own Foundry, Machine Shop, and Engineering Department to insure fast delivery. Get prices and delivery dates from EEMCO where only the best has been built for many years.

EEMCO

ERIE ENGINE & MFG. CO.

Rubber & Plastics Machinery Division

12th St. & East Ave., Erie, Pa.



Indonex

plasticizers

in

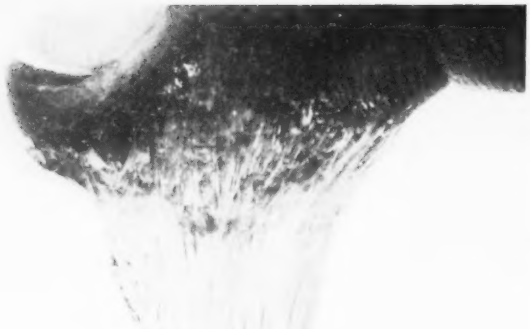
GR-S Extruded Bumper Compounds

Impart good processing and extrusion characteristics—minimize temperature build-up and deterioration under repeated impact.

Send for INDONEX Plasticizers Circular 13-51.

INDOIL®
CHEMICAL PRODUCTS

INDOIL CHEMICAL COMPANY 910 South Michigan Avenue, Chicago 80, Illinois



Oronite

original and major producer of

POLYBUTENES

Since 1935, when Oronite Polybutene was first produced, this important raw material has become widely used in a variety of rubber products. You will find these clear, light colored, chemically inert liquids have a unique tacky property. A technical bulletin giving the physical characteristics and properties of Oronite Polybutenes is available to you on request. Our long experience with Polybutenes is at your disposal—contact the Oronite office nearest you.

"Basic Chemicals for Industry"

ORONITE CHEMICAL COMPANY

ORONITE CHEMICAL COMPANY
200 Bush Street, San Francisco 20, California
30 Rockefeller Plaza, New York 20, New York
714 W. Olympic Blvd., Los Angeles 15, Calif.
20 North Wacker Drive, Chicago 6, Illinois
Mercantile Securities Building, Dallas 1, Texas

3208

VULCANIZED VEGETABLE OILS

—RUBBER SUBSTITUTES—

•

Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

•

A LONG ESTABLISHED AND PROVEN PRODUCT

THE CARTER BELL MFG. CO. SINCE CARTER BELL PRODUCTS 1903 SPRINGFIELD, NEW JERSEY

Represented by:
HARWICK STANDARD CHEMICAL CO.
Akron — Boston — Trenton — Chicago — Denver — Los Angeles

How long did it take...

to get from here.... to here?

ANSWER: 21 YEARS

In 1911, the electric starter mercifully ended the backbreaking chore of hand cranking and became the first step on the way to modern starting at the flick of a finger.

As cars improved, the rubber industry grew along with them until today it is one of the largest in the country.

Monsanto has played an important role in this progress. Its complete line of accelerators, antioxidants and special materials for rubber are virtually standards of the industry. For example, Flectol* H imparts excellent heat resistance and Santoflex* AW is the standard antiozonant of the rubber industry.

For full information, send for your copy of the new catalog "Chemicals for the Rubber Industry." Write: MONSANTO CHEMICAL COMPANY, Rubber Service Dept., 920 Brown Street, Akron 11, Ohio.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY... WHICH SERVES MANKIND

MONSANTO CHEMICALS FOR THE RUBBER INDUSTRY

ANTIOXIDANTS
Flectol H *
Santoflex DD
Santoflex 7S
Santoflex AW
Santowhite* Crystals
Santowhite MK
Santowhite L
Santowhite Powder

MERCAPTO ACCELERATORS
Santocure* NS
Santocure
El-Sixty*
Mertax (Purified Thiotax)
Thiotax (2-Mercaptobenzothiazole)
Thiofide* (2,2'-dithiobis (benzothiazole))
Thiofide S (Seed Form)

ALDEHYDE AMINE ACCELERATORS
A-32
A-100

SPECIAL MATERIALS
Thiocarbanilide ("A-1")
Santovar*-A
Sulfasan R
Insoluble Sulfur "60"

ULTRA ACCELERATORS FOR LATEX, ETC.
R-2 Crystals
RZ-50-A
RZ-50-B

Thiurad* (Tetramethyl-thiuram-disulfide)
Mono Thiurad (Tetramethyl-thiuram-monosulfide)
Ethyl Thiurad

GUANIDINE ACCELERATORS
Diphenylguanidine (D.P.G.)
Guantal*

COLORS

REODORANTS

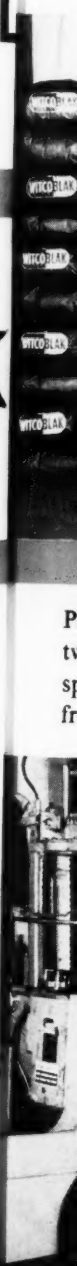
*Reg. U. S. Pat. Off.

Order a shipment of

WITCO-CONTINENTAL

CARBON BLACK

on expendable pallets



WITCO

35 Years of Growth

WITCO CHEMICAL COMPANY

CONTINENTAL CARBON COMPANY

260 Madison Avenue, New York 16, N. Y.

CHICAGO • BOSTON • CLEVELAND • AKRON • ATLANTA • HOUSTON • AMARILLO • LOS ANGELES

SAN FRANCISCO • LONDON AND MANCHESTER, ENGLAND

Witco-Continental pioneered palletized carbon black shipments.

Shipped by rail or truck, palletizing saves you time and money in carbon black handling.

Palletized shipments are loaded and unloaded in minutes rather than hours. Engineered stacking patterns assure smooth riding, optimum freight rates and undamaged delivery.

Palletized loads can be picked up, carried and placed, all by fork lift truck. Load lock adhesive on each bag keeps stacks firm and neat, increases handling safety and speed.

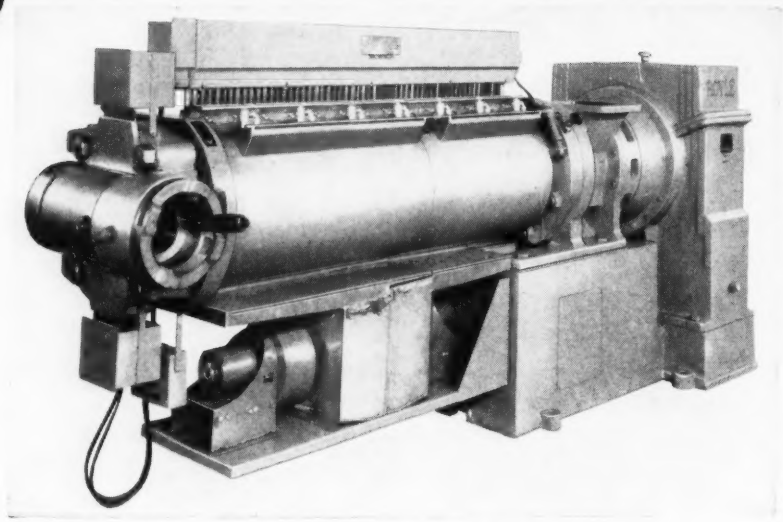
Palletized loads can be stacked in your warehouse, two-high, with ease. You save valuable storage space and materials-handling manpower. Order from Witco-Continental today and save.

Witco—Continental packaging and materials-handling engineers are available for consultation on any specific problem in the further development of materials-handling technique.

THE ROYLE ALL • ELECTRIC SPIROD

The latest addition to the Royle line, these all-electric Spirod extruders are built to supply — and hold — the higher and accurately zoned operating temperatures that are essential to present extrusion processes. This outstanding performance is only possible with the inclusion of a proportioning controlled system of high velocity evaporative cooling combined with tubular resistance heating — just one of the many features that assure economical, dependable production.

Available in standard sizes 1⅛" through 12"



No. 5 8½" ROYLE SPIROD EXTRUDER

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.
Hyde Park 2430 - 0456	SHerwood 2-8262	SWandale 4-5020	LOgan 3261

PATERSON 3, NEW JERSEY

Trade Mark

HEVEATEX CORPORATION

78 GOODYEAR AVENUE
MELROSE 76, MASS.

BRANCHES: CHICAGO, ILL. AKRON, O. DETROIT, MICH. LOS ANGELES, CAL.

Natural and Synthetic

Latex and Latex Compounds

for all purposes

FOR PLASTISOLS that give "PLUS" QUALITIES

in Color Appeal and Service Life without a "Cost Premium"

Products Courtesy of Steere Enterprises, Inc. Akron, Ohio

STABELAN HR-50...

This fluid paste stabilizer, specifically developed for Plastisol formulations, contains plasticizer in addition to cadmium and barium with synergized chelating agent. It is suggested for those desiring a single stabilizer that can be readily stirred into Plastisol formulations with minimum mixing and maximum dispersion . . .

Other **STABELANS** also available —

STABELAN E — Paste — For excellent heat and light stability, and long outdoor aging.

STABELAN HR — Paste — A "single package" stabilizer containing cadmium and barium components with synergized chelating agent.

STABELAN HR — Liquid — A synergized chelating agent.

STABELAN HR — Powder — Metal-bearing component of STABELAN HR Paste.

*STANTONE PC Colors...

Pigments flushed or dispersed in a plasticizer to produce a uniform easy working smooth paste. Extra fineness of pigment particle is developed to assure maximum tinting strength . . . Available in a complete line of colors — yellow, orange, red, blue, green, black and white, developed specifically for easy mixing in Plastisol formulations.

*POLYCIZERS (Plasticizers)

— For Every Compounding Requirement:

POLYCIZER DCP— (Dicapryl Phthalate)
POLYCIZER DBS— (Dibutyl Sebacate)
POLYCIZER DBP— (Dibutyl Phthalate)
POLYCIZER 162— (Dioctyl Phthalate)
POLYCIZER 332— (Dioctyl Adipate)
POLYCIZER 532— (Octyl Decyl Adipate)
POLYCIZER 562— (Octyl Decyl Phthalate)
POLYCIZER 632— (Didecyl Adipate)
POLYCIZER 662— (Didecyl Phthalate)
*CELLUFLEX 179C— (Tricresyl Phosphate)
*CELLUFLEX 112— (Diphenyl Cresyl Phosphate)

* Registered U. S. Patent Office

STABELANS are manufactured by Stabelan Chemical Company

Write your nearest office for complete data

HARWICK STANDARD CHEMICAL CO.

60 South Seiberling Street, Akron 5, Ohio

Boston 16, Mass. 661 Boylston Street
Trenton 9, New Jersey 2595 E. State Street
Chicago 25, Illinois 2724 W. Lawrence Ave.
Los Angeles 21, Calif. 1248 Wholesale Street

Manufacturers of CANARY LINERS

Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

EXPORT AGENT
Binney & Smith International, Inc.
380 Madison Ave., New York 17, N. Y.

CANADIAN AGENT
Binney & Smith, Limited
33 Edward Street, Toronto 3, Ontario, Canada

J. J. WHITE Products Co.

7000 UNION AVENUE
CLEVELAND 5, OHIO

THE SEAL OF DEPENDABILITY

Our products are engineered to fill every need in natural and synthetic rubber compounding wherever the use of vulcanized oil is indicated.

We point with pride not only to a complete line of solid Brown, White, "Neophax" and "Amberex" grades, but also to our hydrocarbon solutions of "Factice" for use in their appropriate compounds.

Continuing research and development in our laboratory and rigid production control has made us the leader in this field. The services of our laboratory are at your disposal in solving your compounding problems.

Oldest and Largest Manufacturers of "Factice" Brand Vulcanized Oil Since 1900

Reg. U.S. Pat. Off.

THE STAMFORD RUBBER SUPPLY COMPANY
Stamford, Conn.

ANOTHER QUALITY CHEMICAL BY GENERAL TIRE
KURE-BLEND MT®
. . . a true masterbatch
providing excellent dispersion
Kure-Blend MT is a latex-compounded masterbatch containing 50% Tetramethyl Thiuram Disulfide and 50% GR-S Type Rubber. If you want the ultimate in fast easy mixing and excellent dispersion, use Kure-Blend.
For sample and reference data on Kure-Blend MT write to The General Tire & Rubber Company, Chemical Division, Akron, Ohio, or our
Sales Agents—Harwick Standard Chemical Co., U. S. A.
R. M. Ferguson Co., Canada.
Binney & Smith International Inc., Export.
Creating Progress Through Chemistry
General Tire also produces . . .
Vygen* (Polyvinyl Chloride) • Gen-Flo* (Paint Latex)
Gen-Tac* (Vinyl Pyridine Latex) • Ko-Blend® (Insoluble Sulfur Masterbatch)
• Glykon* (Polyester Resin) • Polystop® (GRS Shortstop)
*T. M. G. T. & R. Co.
Chemical Division
GENERAL
THE GENERAL TIRE & RUBBER CO.
KURE-BLEND MT

HOGGSON TOOLS, MOLDS AND DIES
For Rubber Testing & Production

Shown here are but a few of the many types of rubber working equipment available. Please submit your problem.

BENCH MARKER

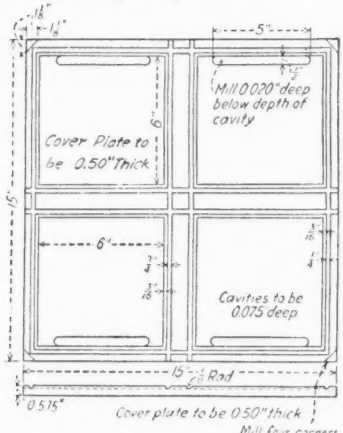
1" and 2" Centers

SHOE STITCHER

PORCUPINE ROLLER

CONCAVE ROLLER

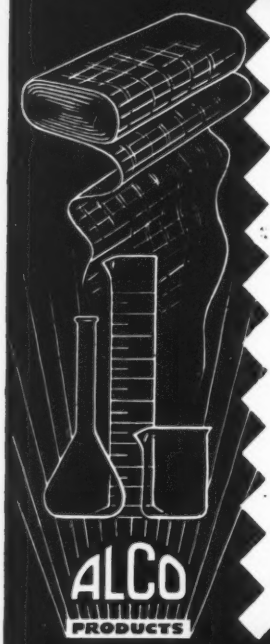
Pacific Coast: H. M. Royal, Inc., Los Angeles


Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
Cavities to be 0.075 deep
Cover plate to be 0.50" thick
Mill four corners 8 deep for prying mold apart

(Above)

Standard ASTM and Federal dies for cutting test tensile and tear strength samples, and dies for slab curing carried in stock. Write for catalog.

HOGGSON & PETTIS MANUFACTURING CO. • 141S Brewery St. • NEW HAVEN 7, CONN.



VULCANOL*

The VULCANOLS REPRESENT a group of durable textile finishes which, when coated on textile fabrics, provide fiber conservation, pile anchorage, non-skid properties, slip resistance, and resistance to raveling or fraying.

•

Distributors for Firestone Liberian Latex

•

Our Sales and Technical Staffs Are at Your Disposal

*Registered Trademark

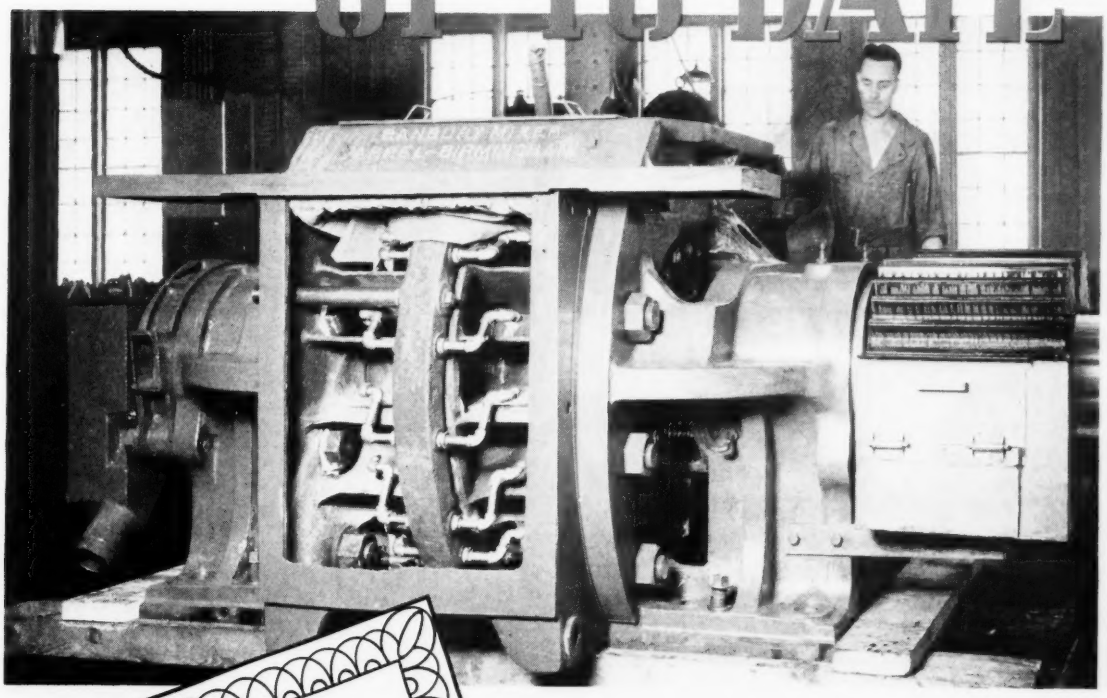
ALCO OIL & CHEMICAL CORPORATION

TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

NEW ENGLAND OFFICE
Alco Oil & Chemical Corp.
610 Industrial Trust Bldg.
111 Westminister St.
Providence 3, R. I.
Phone: ELmhurst 1-4559

How Farrel-Birmingham rebuilding brings your Banbury®

UP TO DATE



Banbury mixer bodies rebuilt by Farrel-Birmingham carry a new machine GUARANTEE

At Farrel-Birmingham, the Banbury mixer is constantly being improved in design and materials to keep pace with tougher service demands in the rubber industry, and the severe duty encountered in the production of certain types of plastic materials.

It will pay you to remember this when your Banbury mixer needs rebuilding, because the modern features of design and improved materials, which are now incorporated in new Banburys are readily adaptable to existing machines. These improvements can mean higher operating efficiency and greater wearing qualities for your Banbury mixer.

Remember too, that the use of our special equipment and facilities in rebuilding work assures both accuracy and quick service. This service is further facilitated by the largest existing stock of rotors, bodies and other parts. Complete bodies can be shipped from stock—from our Buffalo plant for western points and from our Derby plant for eastern points.

For details, contact any of the offices listed.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN. (REgent 4-3331)

AKRON, OHIO, 2710 First National Tower (POrtage 2-8871)
CHICAGO, ILL., 120 South LaSalle Street (ANdover 3-6434)
LOS ANGELES, CALIF., 2032 Santa Fe Avenue (Lafayette 3017)
HOUSTON, TEXAS, 860A M & M Building (CApitol 6242)

Farrel-Birmingham®

QUESTION: WHAT IS THE BEST BUY IN REINFORCING PIGMENTS? ANSWER: CLAY... PARTICULARLY SUPREX AND PARAGON--QUALITY STANDARDS FOR HARD AND SOFT CLAYS.

CLAY is such a common ingredient in rubber recipes, and so widely accepted, that formulators sometimes forget its superlative reinforcing quality—and that no other pigment can rival it for economy. Without a doubt, clays are the least expensive reinforcing pigments used in the rubber industry today.

SUPREX and *PARAGON* have been outstanding values since they were first introduced in 1925. They have been tried and tested in virtually all types of rubber formulations—and are proved and accepted by formulators throughout the world.

HUBER

Manufacturers of
Furnace Blacks
Channel Blacks
Rubber Clays
Rubber Chemicals

J. M. HUBER CORPORATION • 100 Park Avenue • New York 17, N. Y.

AROMEX HAF • AROMEX CF • AROMEX ISAF • AROMEX SAF • MODULEX (HMF)
WYEX (EPC) • ARROW TX (MPC) • ESSEX (SRF) • AROVEL (FEF) • COLLOCARBS

RUBBER WORLD

published monthly by
BILL BROTHERS PUBLISHING CORPORATION

editorial and executives offices
386 Fourth Avenue, New York 16, N. Y.
LExington 2-1760

Chicago office
333 North Michigan Avenue
State 2-1266

chairman of board and treasurer
Raymond Bill

president and general manager
Edward Lyman Bill

vice presidents
B. Brittain Wilson
C. Ernest Lovejoy
William H. McCleary

general manager
B. Brittain Wilson

editor
Robert G. Seaman

managing editor
S. R. Hague

associate editor
Arthur M. Merrill

assistant editor
Morton Zelenko

contributing editor
Robert C. Toth

advertising manager
Rufus H. Fairchild

production manager
M. A. Larson

circulation manager
M. J. McCarthy

EDITORIAL ADVISORY BOARD

JOHN BALL — J. H. FIELDING
P. D. BRASS — LOUIS H. HOWLAND
B. H. CAPEN — S. D. GEHMAN
C. C. DAVIS — W. E. KAVENAGH
R. A. SCHATZEL

SUBSCRIPTION PRICES
United States, $5.00 per year; Canada, $6.00; all other countries, $7.00. Single copies in the U. S., 50¢; elsewhere, 60¢.

OTHER BILL BROTHERS PUBLICATIONS
In Marketing, SALES MANAGEMENT, SALES MEETINGS, PREMIUM PRACTICE. In Merchandising, FLOOR COVERING PROFITS, FOUNTAIN & FAST FOOD, GROCER-GRAPHIC, TIRES-TBA. Merchandising, YANKEE FOOD MERCHANT. In Industry, PLASTICS TECHNOLOGY.

Copyright April, 1955
by Bill Brothers Publishing Corp.

VOLUME 132 • NUMBER 1 • APRIL, 1955

CONTENTS

55 **Recent Developments in Rubber-to-Metal Bonding** */Howard H. Irvin and William H. Cornell*

62 **Ozone Crazing of Biaxially Stressed GR-S Vulcanizates** */Z. T. Ossefort and W. J. Touhey*

64 **Carbon Black-Silica Mixtures in Tire Treads** */Ralph F. Wolf*

DEPARTMENTS

71 Editorials
72 Meetings and Reports
News of the Month
81 United States
94 Financial
96 News from Abroad
100 New Equipment
104 New Materials
108 New Products
110 Book Reviews
111 New Publications
113 Bibliography
118 Statistics
128 Calendar of Coming Events

MARKET REVIEWS

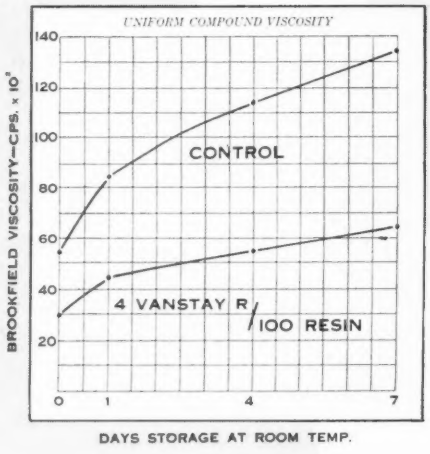
114 Rubber
114 Reclaimed Rubber
114 Scrap Rubber
114 Cotton Fabrics
116 Rayon

Cover photograph *(Reni Photos)*: Richardson of Goodrich *(Extreme Left)* Testifying before the Senate Banking & Currency Subcommittee Hearing on Disposal Contracts

now available

VANSTAY R

new liquid
Heat Stabilizer
for Vinyl



PLASTISOLS • ORGANOSOLS
SLUSH MOLDING COMPOUNDS

The essential properties of compound uniformity, crystal clarity, minimum heat discoloration and good aging are obtained by formulating with VANSTAY R.

Consult Vanderbilt Technical Service for advice or assistance in using VANSTAY Heat and Light Stabilizers to your advantage.

R. T. VANDERBILT CO., INC.

230 PARK AVE., NEW YORK 17, N.Y.

developed for

MAXIMUM CLARITY • MINIMUM HEAT DISCOLORATION

RUBBER WORLD

APRIL, 1955

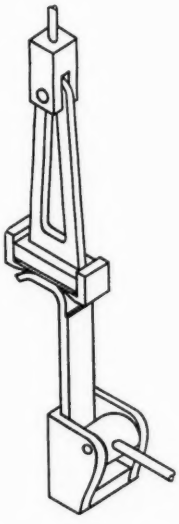


Fig. 1. Ninety-degree pull adhesion text fixture

Recent Developments in Rubber-to-Metal Bonding[1]

By HOWARD H. IRVIN and WILLIAM H. CORNELL

Marbon Chemical Division, Borg-Warner Corp., Gary, Ind.

Information on a new rubber-to-metal bonding system, which is effective in bonding the most widely used elastomers on the market today, is presented in this article.

The new bonding system is insensitive to disturbing variations in atmospheric conditions and is also particularly effective for bonding at the high curing temperatures and with the short curing cycles used in many rubber plants today.

RUBBER has an unusual ability to absorb shock and to dampen vibration; it also has excellent resistance to attack by many chemicals.

Since most metals lack these properties, combining rubber with metal—and particularly steel—has proved to be the welcome solution to many design problems. For such combinations to be effective in the application, a strong and permanent bond must be attained between rubber and metal, and a tenacious bond is best formed during the vulcanization of the rubber.

Early Developments

Years ago it had been found that a good rubber-to-steel bond could be obtained by brass plating the steel under carefully controlled conditions and by vulcanizing the rubber immediately to the freshly plated surface.

Brass plating has been used successfully for many years and is still in use in many rubber plants today, particularly on small parts that lend themselves to barrel plating.

Brass plating, however, has many drawbacks. It requires an appreciable capital investment in plating equipment and in floor space to house it. Unless the composition of the brass deposit is carefully controlled and held within narrow limits, adhesion failures occur readily. The fresh brass deposit must be promptly protected from oxidation, usually by applying a cover cement before curing.

For many years, therefore, research had been under way to find other, simpler methods for bonding. When Ty-Ply Q,[2] a chemical bonding agent, appeared on the market in 1939, it was an immediate commercial success, because it literally replaced the brass plating line with a paint brush. Ty-Ply Q was adopted for many applications and did an excellent job during World War II, when it was used almost exclusively to bond motor mountings and tank block tread assemblies.

[1]Presented before the Division of Rubber Chemistry, A. C. S., New York, N. Y., Sept. 16, 1954.

[2]Trade mark of Marbon Chemical.

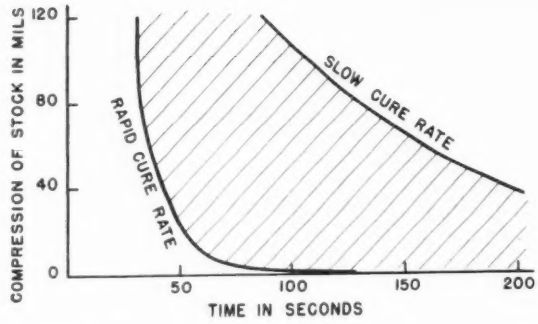


Fig. 2. Effect of cure rate of elastomer on adhesion. "Time in seconds" is determined using Williams plastometer, and is the decrease in flow rate of stock under compression

Recent Developments

Continued development work in recent years has been directed toward an adhesive system which would not only bond many of the new elastomers that have appeared on the market, but would also function under the most adverse conditions encountered in a rubber plant and, at the same time, maintain the high level of bond strength which the industry has come to expect.

New Test Methods

In this work it became apparent at an early date that the accepted test methods for evaluating rubber-to-metal adhesion were either impractical or not consistent enough to appraise experimental adhesive formulations rapidly and effectively.

After many trials, a method developed in the laboratories of Lord Mfg. Co., Erie, Pa., was adopted, since it met the requirements for a simple and reliable test procedure. It evaluates rubber-to-metal adhesion by measuring the 90-degree angle pull necessary to separate a one-inch wide strip of rubber from a metal surface to which it has been bonded in a simple molding operation.

A jig, which is shown in Figure 1, makes it possible to use any standard tensile testing machine with a minimum capacity of 200 pounds for this test. The "Lord" Method has proved very helpful and is currently under examination by a committee of the American Society for Testing Materials for possible adoption as an ASTM standard.[3]

Developing a New Adhesive System

A new adhesive system, to be effective, must have versatility; that is, it must bond most any stock, regardless of the type of elastomer, the hardness of the stock, or its acceleration or sulfur content. Since natural rubber, GR-S, neoprene, and nitrile rubber represent the majority of elastomers which are commonly bonded to metal, the work described here was concentrated on them—particularly on natural rubber and GR-S, because they are the more difficult to bond.

In order to provide an adhesive system with a bonding efficiency unaffected by the elastomer compound used, it was found desirable to develop a primer-cover coat combination: the primer of distinctive blue color, to furnish adhesion to the metal, and the black cover coat to form the bridge between primer and rubber stock, and to provide a protective layer over the adhesive-coated metal parts during handling and storage.

In the course of this work it became apparent that widely varying cure rate is a more critical factor in obtaining satisfactory adhesion than the type of elastomer used.

On the basis of this evidence a graph could be constructed which covers the cure rate characteristics of a large variety of stocks, as determined by measuring the decrease in flow rate of the stock under compression in a Williams plastometer[4] at 320° F. (See Figure 2.)

[3] Has been recommended as a replacement for Method B of D429, Adhesion of Vulcanized Rubber to Metal, ASTM Committee D-11 on Rubber and Rubber-Like Materials.

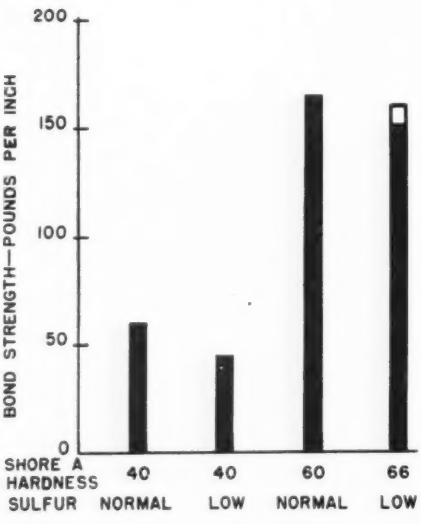


Fig. 3. Bond strength of natural rubber mechanical goods stocks of varying hardness and sulfur content with Ty-Ply UP/RC

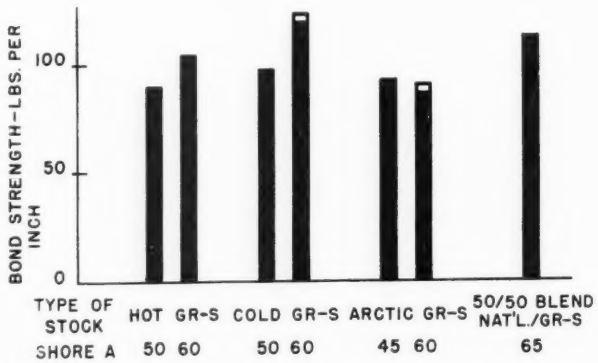


Fig. 4. Bond strength of GR-S and GR-S blends of mechanical goods stocks of varying hardness with Ty-Ply UP/RC

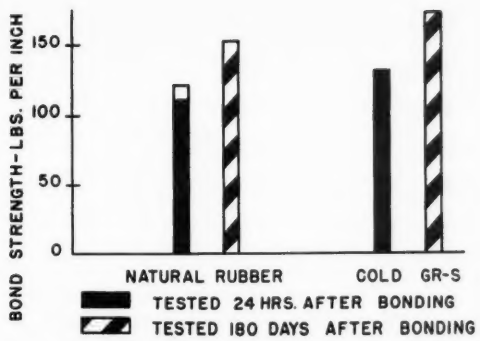


Fig. 5. Effect of static room temperature aging of natural rubber and GR-S stocks on bond strength

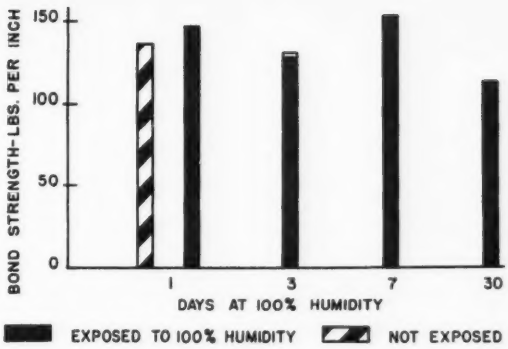


Fig. 6. Effect of aging bonded assemblies in high humidity conditions

Once an adhesive system had been developed which would bond stocks with cure rates representing the extremes shown in the graph, it was a great deal easier to make the minor modifications necessary to render the system applicable to all stocks covered by the graph, giving a bond consistently stronger than the rubber stock itself.

Adhesive Versatility

The quality of adhesion that can be achieved with the new Ty-Ply UP/RC[2] system is shown in Figures 3 and 4. Arctic GR-S, polybutadiene, and oil-extended GR-S stocks show equivalent results.

The Ty-Ply UP primer by itself provides an excellent bond for a range of neoprene stocks, varying in hardness and base polymer used. Nitrile rubber stocks, unless highly plasticized, are also effectively bonded with Ty-Ply UP without the use of a cover cement. (See Table 1.)

TABLE 1. BONDING OF NEOPRENE AND NITRILE MECHANICAL GOODS COMPOUNDS WITH TY-PLY UP

Type Polymer	Shore A Duro.	Lbs. Pull/Inch	% Rubber Break
Neoprene GN-A	40	70	100
	50	75	100
	60	115	100
Neoprene W	40	90	100
	50	80	100
	60	60	100
Neoprene WRT	40	105	100
	50	90	100
	60	70	88
Nitrile Rubber	65	144	100
Highly plasticized	45	0	0

In order for an adhesive system to have real versatility, it must not only provide good adhesion to the various elastomers, but to most common metals as well.

The Ty-Ply UP/RC system does provide adhesion to

[2] The method used for determining the cure rate with the Williams plastometer was ASTM Method D926-47-T, modified as follows:

Cylindrical test specimens of the different stocks were cut with a cork borer to 9/16-inch diameter and 9/16-inch in length instead of making them in a die. The specimens were placed between Holland cloth in a Williams plastometer at a temperature of 160°C. The decrease in thickness was recorded every 30 seconds, until no more change took place, indicating that a cure had been effected. Curves were drawn by plotting the change in mils of the plastometer reading against time. The value of five mils on the plastometer was taken as the value at which a compressibility of five mils remained under a weight of 5,000 grams.

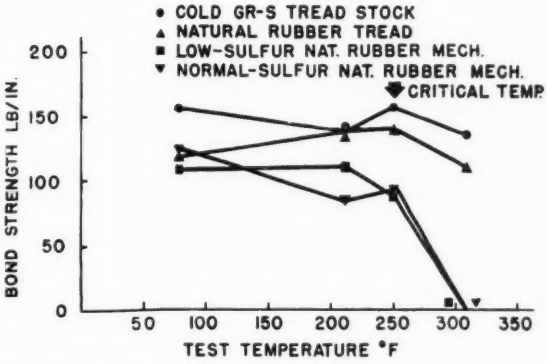


Fig. 7. Variation of bond strength of different stocks at elevated temperatures

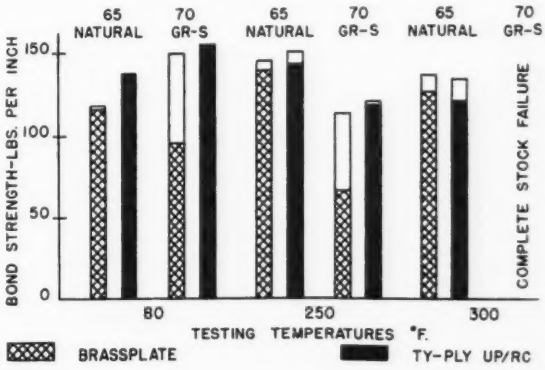


Fig. 8. Brass plate versus chemical bonding at elevated temperatures. Solid bar indicates failure occurred in rubber stock; unshaded areas indicate failure between stock and adhesive. The numbers above the bar graphs represent the Shore hardness of the stocks

Monel, aluminum, magnesium, stainless steel, and cadmium-plated steel for many natural rubber and GR-S stocks. With nickel and stainless steel, as well as with most brasses, the types of failure obtained are only partially in the rubber stock. (Table 2.)

TABLE 2. BONDS OBTAINED WITH TY-PLY UP RC TO VARIOUS METALS

	Natural Rubber		GR-S 1500	
Metal Used	Lbs./In. Pull	% Rubber Break	Lbs./In. Pull	% Rubber Break
302 Stainless	122	53	100	43
Monel	55	12	105	33
AL. 35	90	90	100	23
Anodized	125	97	170	94
Dow metal	100	93	120	99
Cadmium plate	140	100	130	97
Muntz metal	35	1		
Cartridge brass	45	5		
Nickel	55	8	108	35

Metal Preparation

Proper metal preparation is of utmost importance and may make the difference between a mediocre and an excellent bond. Abrasive cleaning and acid pickling methods are satisfactory for steel and many other metals. For aluminum, an oxide coating is recommended, and a chromic acid treatment is generally mandatory for obtaining a bond to magnesium. In all cases, however, a smooth satin finish is recommended for the metal. Coarse grit or shot blasting gives rough surfaces which should be avoided for best results.

Permanence of the Chemical Bond

Having developed an adhesive system which met the requirement of versatility in bonding a wide range of elastomer compounds to various metals, it became necessary to determine whether this new system would meet the second important requirement—namely, that of forming a permanent bond.

Bonded assemblies were therefore subjected to various test conditions to evaluate the permanence of the Ty-Ply UP/RC bond.

Observations were made on the effect of static aging, and shock and dynamic fatigue on bond-strength.

Effect of Static Aging

Static aging at room temperature over a period of 180 days has no deleterious effect on bond strength; in fact, as can be seen in Figure 5, the bond strength actually increases on aging. When the same static aging test was performed at 100% relative humidity (by keeping the assemblies under test in an airtight dessicator over water for 30 days), no deterioration of the bond was noticeable, with a 100% failure occurring in the rubber stock. (See Figure 6.)

An important property of the rubber-to-metal bond is its strength at elevated temperatures. Tests performed on Ty-Ply UP/RC bonded assemblies, using either natural rubber or GR-S, indicate, in general, that the bond withstands higher temperatures than the rubber stock itself.

Deterioration in these cases is caused by the destructive influence of heat on the elastomer.

As is shown in Figure 7, no appreciable loss of bond strength occurs up to 250° F., but at higher temperatures failure occurs rather rapidly because of deterioration of most stocks. Prolonged exposure above 250° F. is not recommended.

A study was also made to compare adhesion of brass plate bonded and chemically bonded natural rubber and GR-S stocks at elevated temperatures. The test results in this particular series indicate the superiority of the chemical bond, in that it produced predominantly stock failures. The ultimate bond strength, however, was about the same for both bonding systems. (See Figure 8.)

Effect of Impact (Shock Loading)

Since one of the valuable characteristics of a rubber compound is its ability to absorb shock, any design engineer specifying a rubber-to-metal assembly is vitally interested in the ability of a rubber-to-metal bond to withstand shock.

For the purpose of evaluating this property, a relatively simple test was devised. It consists of allowing a 71-pound weight to fall freely through approximately 24 inches of space on to a ball peen hammer, which in turn causes an indentation in the metal component of a steel-rubber sandwich. This set-up is shown in Figure 9.

The test assembly is then sawed in half at the point of impact and checked for failure. (See Figures 10 and 11.)

No failures have ever been observed under these conditions, with the Ty-Ply UP/RC bonding system.

Effect of Dynamic Loading

No standard test methods exist for evaluating resistance to dynamic fatigue of a rubber-to-metal bond, although several types of machines are being used in industry for such tests, one of which is the Sonntag universal fatigue testing machine.[5]

A series of tests was performed on a Sonntag unit, operating at a frequency of 1,800 cycles per minute. In the initial work a Shore A 40 natural rubber compound was bonded to vapor blasted steel buttons with the Ty-Ply UP/RC system. The rubber interlayer was ½-inch thick. The entire assembly was then subjected to a constant asymmetrical load at a preset deflection in tension and compression. The total deflection was varied in different tests.

The testing unit is shown in Figure 12, and assemblies under actual test are shown in compression (Figure 13) and under tension (Figure 14).

In initial trials the machine was operated until destruction of the assembly occurred through rubber failure.

Having determined total cycles required to achieve complete failure, the tests were repeated, but run for only half the number of cycles, and bond strength was compared to that of unflexed control assemblies.

The results of these tests are shown in Figure 15, indicating that under the most severe test conditions,

[5] Sonntag Scientific Corp. of Baldwin-Lima-Hamilton Corp., Greenwich, Conn.

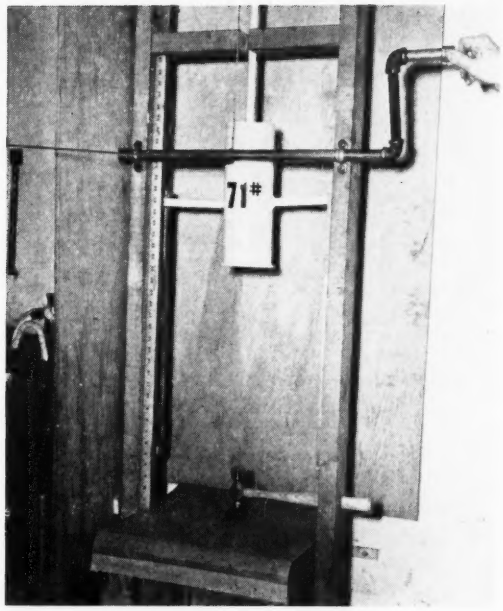


Fig. 9. Apparatus for determining effect of shock loading on bond

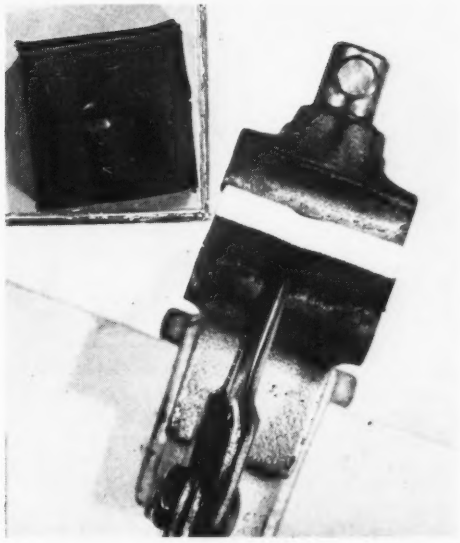


Fig. 10. (Upper left) Metal-rubber sandwich showing dent from impact of 71-pound weight on hammer resting on assembly

Fig. 11. Test piece after having been cut in half to show that rubber-to-metal bond at point of impact is unimpaired

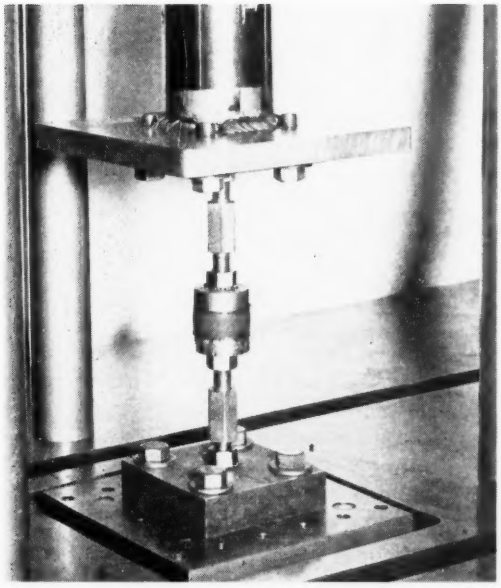


Fig. 12. Rubber-metal bonded test specimen in place on Sonntag universal fatigue testing machine

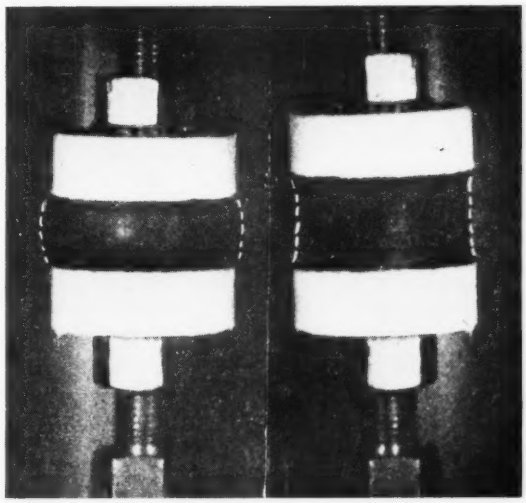


Fig. 13. High-speed photograph showing maximum compression of sample during test

Fig. 14. High-speed photograph showing maximum tension of sample during test

bond strength after flexing was appreciably lower because of the deterioration of the elastomer compound. No failures occurred on any assembly at the adhesive interfaces.

Similar tests were repeated, evaluating the brass plate bond *versus* the chemical bond. In this case harder compounds were used to assure good adhesion to brass plate. Because these compounds were less resilient, "half life tests" were performed over a much smaller number of cycles.

The results, which are shown in Figure 16, indicate approximately equivalent results for both bonding methods, but show again a certain amount of superiority for the chemical bond as to type of failure obtained.

When the results of these dynamic tests are being interpreted, consideration should be given to the fact that frequencies encountered in most practical applica-

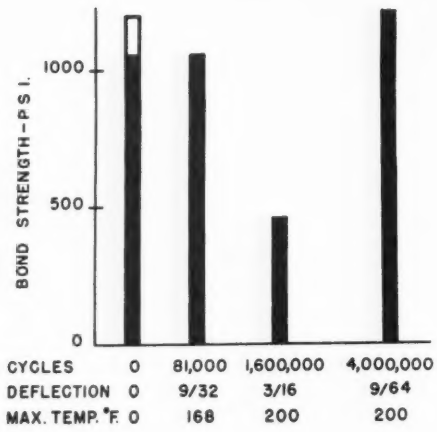


Fig. 15. Effect of dynamic flexing on natural rubber mechanical goods stock bonded with Ty-Ply UP/RC. Bar on left is control sample which was not flexed. "Deflection" is total change in inches during each compression cycle

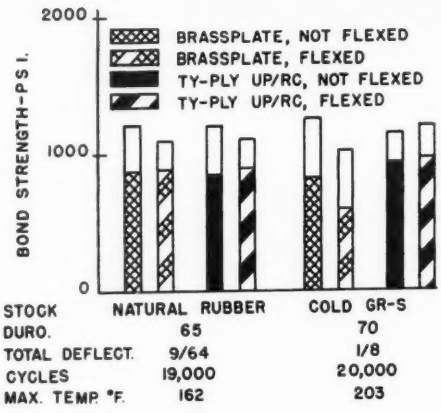


Fig. 16. Effect of dynamic flexing on brass plate versus Ty-Ply UP/RC bonds. Shaded bars indicate failure in rubber stock; and unshaded areas, failure between stock and adhesive

tions are less than half those induced on a Sonntag machine, and that the strain put on both the stock and the bond is considerably less severe under normal conditions.

Factors Affecting Bonding Efficiency

Having considered the versatility of this chemical bonding system and confirmed the permanence of the bond, it became necessary to investigate the third important aspect—namely, the ruggedness of the system during use.

Temperature, humidity, and other atmospheric conditions, as well as the time element, may vary enough from day to day for the production manager to demand a bonding system which is unaffected by any of the above-mentioned variables in its bonding efficiency.

The Ty-Ply UP/RC system is essentially unaffected by any of the important factors encountered on a production line.

The following items and their effect on resulting bond strength were investigated: (1) variation in adhesive application temperatures; (2) force drying of applied adhesive; (3) variations in length of adhesive dry time; (4) exposure of adhesive coated steel to 100% humidity; (5) exposure of adhesive coated steel to ozone; (6) variations in cure times and temperatures.

Figure 17 indicates that where it is desired to speed up the drying of the adhesive by heating either the adhesive or the metal, temperatures of 150° F. probably should not be exceeded. Adhesion shows little tendency to drop off, however, until a temperature of about 180° F. is reached. The same holds true for force drying the adhesive coated metal parts with hot air (Figure 18), where temperatures in excess of 150° F. should also be avoided.

Figure 19 shows that coated assemblies do not have to be put together immediately upon drying, but can be stored for reasonable lengths of time, such as during week-end shutdowns of production lines, without any effect on the ultimate bond strength attainable. The graph shows only values for natural rubber, but GR-S would give quite similar results.

High humidity has for a long time been considered very deleterious to obtaining good rubber-to-metal bonds. While it is still felt that high humidity conditions during assembly operations should be avoided, the results of exposure to 100% humidity of adhesive-coated steel shown in Figure 20 indicate the relative immunity of the Ty-Ply UP/RC system to high humidity conditions.

Ozone falls into the same category as humidity, except that very short exposures to even low concentrations of ozone usually destroy the adhesive qualities of most bonding cements. Ty-Ply UP/RC-coated metal panels were exposed to 180 ppm. of ozone for one minute without loss of bond strength, as shown in Figure 21.

With press time at a premium, the tendency in fabricating plants has been to increase cure temperatures in order to shorten cure cycles. Many adhesives are quite sensitive to variations in cure time and temperature and lose effectiveness when high temperature and shortened cure cycles are used. Figure 22 shows that identical results are obtained when rubber stocks are bonded at temperatures varying from 250-350° F. with cure cycles from as high as 50 minutes at 250° F. to as low as three minutes at 350° F.

Summary and Conclusions

Chemical bonding of rubber to metal is a relatively new technique, having found widespread commercial application only a little more than 15 years ago. During World War II this method of bonding developed rapidly at the expense of brass plating, which, among other things, requires expensive special plating equipment. The use of the chemical method of bonding allows any rubber fabricator to take on rubber-to-metal bonding

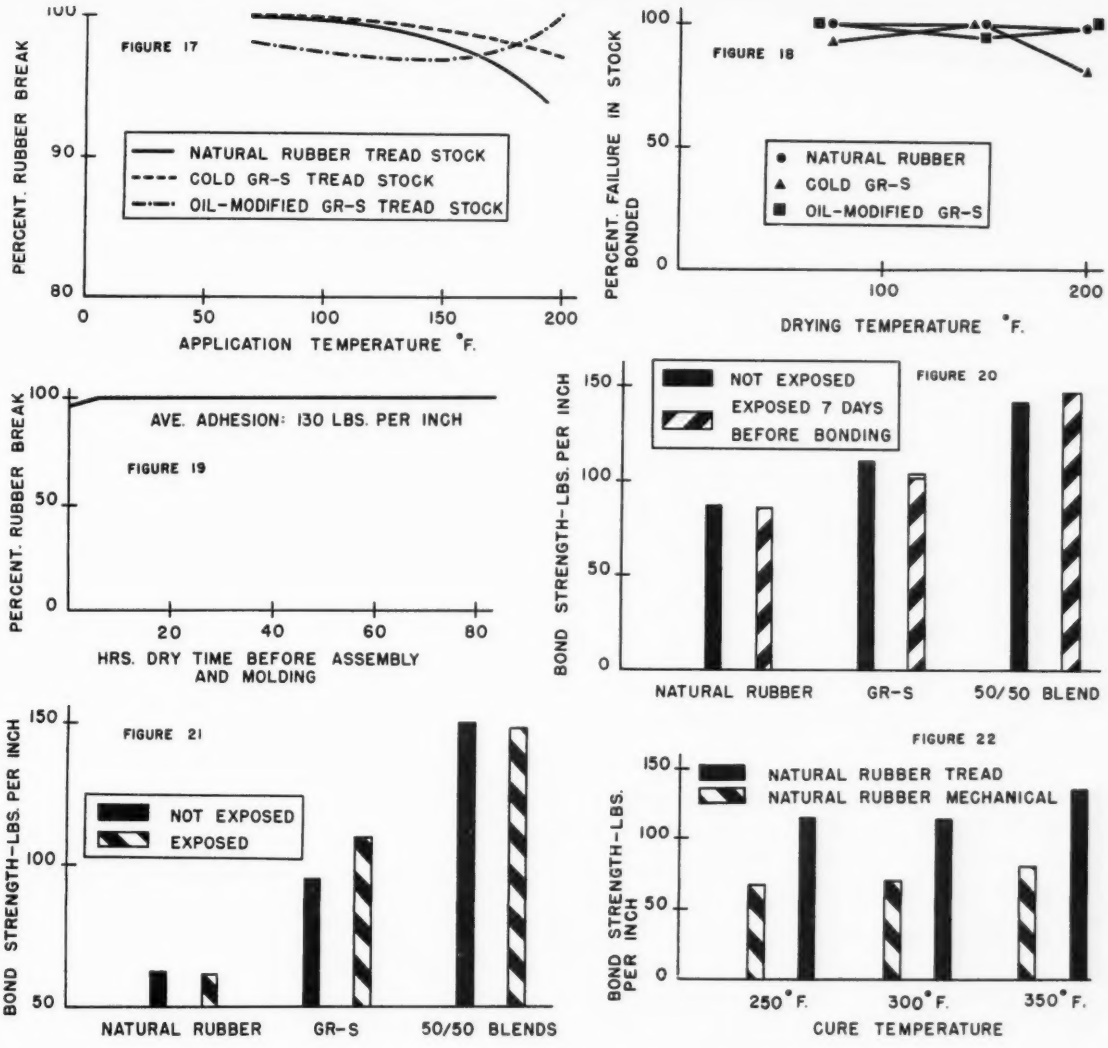


Fig. 17. Effect of temperature of application on bond strength
Fig. 18. Effect of forced air drying at elevated temperatures on bond strength
Fig. 19. Effect of adhesive dry time on bond strength
Fig. 20. Effect of exposure to 100% humidity on adhesive-coated steel
Fig. 21. Effect of ozone exposure on adhesive-coated steel
Fig. 22. Effect of cure temperature on bond strength

work without the installation of costly plating equipment.

While the first chemical bonding agents were designed specifically for bonding natural rubber, the advent of many different types of synthetic rubbers posed new problems both to the rubber fabricators and the producers of rubber-to-metal bonding agents. Information has been presented on a new rubber-to-metal bonding system which was developed after many years of intensive work and which, according to the results reported here, is effective in bonding the most widely used elastomers on the market today.

This new bonding system is also insensitive to the many disturbing effects of atmospheric conditions. It is particularly effective for bonding at the high curing temperatures and short cure cycles used in many rubber plants today and should, therefore, help promote further the already rapid growth of chemical rubber-to-metal bonding.

Reprints of "The Shrinkage of Mold Cured Elastomer Compositions," by Juve and Beatty, from our October, 1954, issue, are available at 10¢ each

Ozone Crazing of Biaxially Stressed GR-S Vulcanizates[1]

By Z. T. OSSEFORT and W. J. TOUHEY

U.S. Army, Ordnance Corps, Rock Island Arsenal, Rock Island, Ill.

It has been shown that "crazing" of stressed GR-S vulcanizates, previously attributed solely to light activated oxidation, can be caused by ozone in the absence of light.

IT IS a generally recognized phenomenon that the surface of stressed GR-S vulcanizates is subject to cracking upon aging (unless protected by the presence of suitable antiozidants).[2] This cracking has for many years been considered to be of two distinct types:

1. Regular cracking formed perpendicular to the axis of stress and caused by ozone in the atmosphere.
2. Irregular cracking or "crazing," which is usually not so deep and follows no pattern with respect to the axis of stress. This has been attributed to light activated oxidation.[3]

Since even the regular cracking was for a great many years attributed to the action of light and was erroneously referred to as "sun checking," the possibility was entertained that both types may be manifestations of ozone attack; the differentiating feature between the two is the manner under which the rubber is stressed.

It was, therefore, the purpose of this work to determine whether typical "crazing" of stressed GR-S vulcanizates could be produced by ozone in the dark.

Experimental Procedure

Cross-shaped specimens 3- by 3- by 0.080-inch were cut from vulcanized pads. These pads were prepared from a typical tread-type GR-S stock, formula for which is given in Table 1.

These specimens were subjected to varying amounts of biaxial stress, and the areas of greatest stress pro-

(*Continued on page 70*)

[1] The opinions or assertions contained herein are not to be construed as official or reflecting the views of the Department of the Army.

[2] Shaw, Ossefort, Touhey, RUBBER WORLD, Aug., 1954, p. 636.

[3] Crabtree and Kemp, *Ind. Eng. Chem.*, Mar., 1946, p. 2781. Winkelmann, *Ibid.*, Apr., 1952, p. 841.

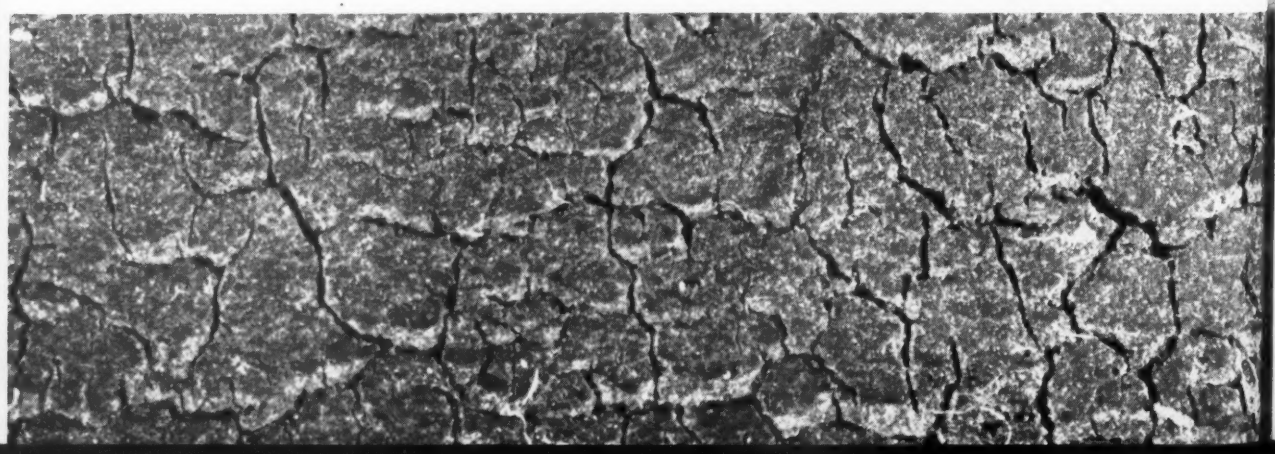
Fig. 1. GR-S tread stock specimens exposed in ozone cabinet in dark and exposed outdoors while subjected to uniaxial and multiaxial stress (see opposite page)

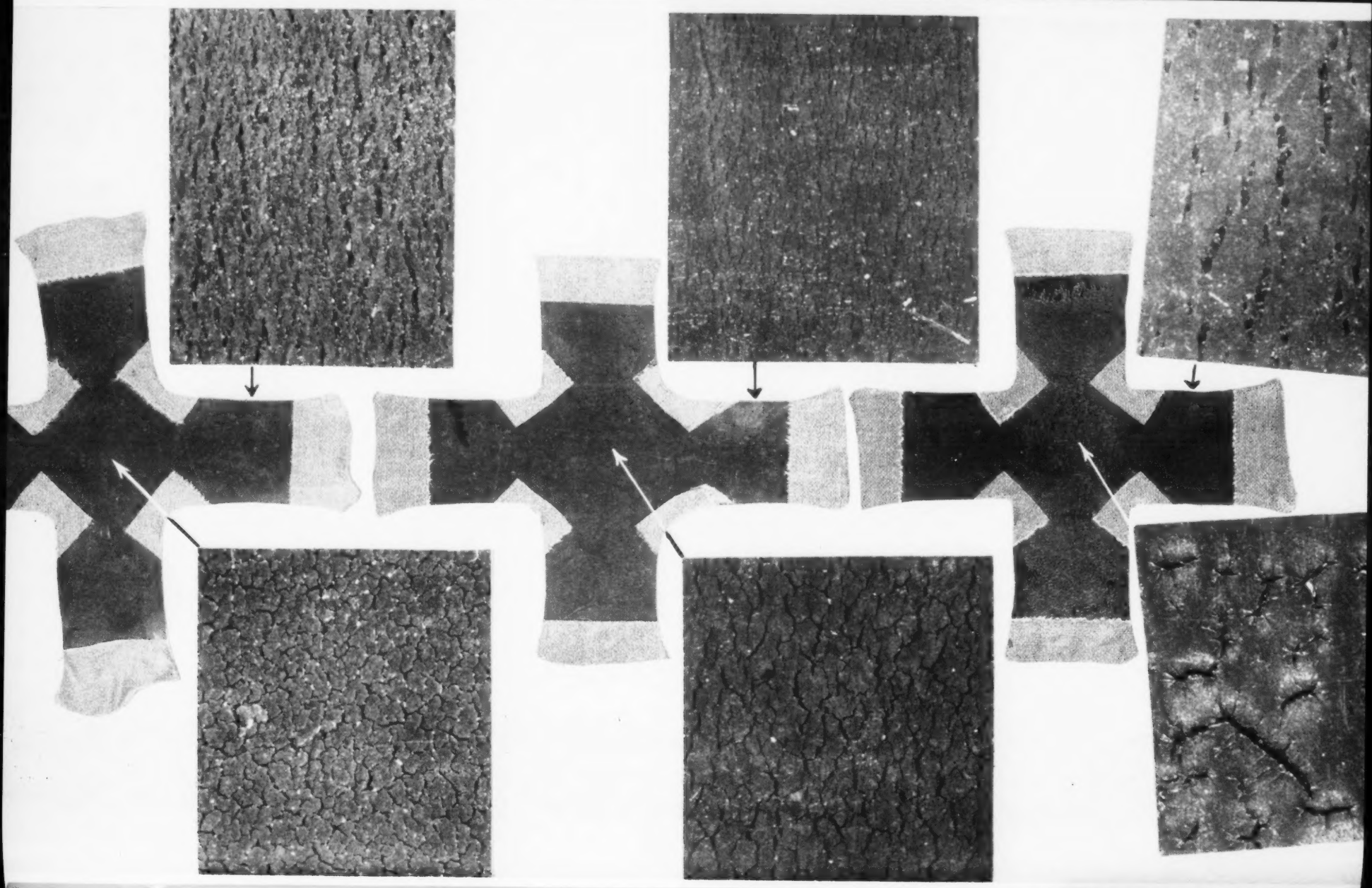
(Top) Specimens exposed 43 hours in ozone cabinet; sample on right was stressed 12½% in one direction; while sample on left was stressed 12½% in two directions. Examined under a magnification of 20 times

(Middle) Specimens exposed 24 hours in ozone cabinet; sample on right was stressed 16% in one direction; while sample on left was stressed 9% in one direction and 16% in the other. Magnification 20 times, as above

(Bottom) Specimens exposed four days outdoors. Sample on right had 12½% stress in one direction; sample on left had stress of 12½% in two directions. Magnification 20 times

Fig. 2. Typical crazing of tire sidewall after several thousand miles of service. Similarity between this crazing and that induced by ozone exposure of biaxially stressed stocks of Figure 1 is evident





Carbon Black-Silica Mixtures in Tire Treads

By RALPH F. WOLF

Columbia-Southern Chemical Corp., Barberton, O.

This preliminary report on the effect of replacing some of the carbon black with silica pigments in natural rubber tire treads indicates that tread wear is more satisfactory than would have been predicted from the known performance of all silica treads.

Carbon black-silica tread compounds have greater resistance to hand tear, and it is considered possible that their use might result in improved tires for off-the-road service.

TIRE treads containing only amorphous, fine particle size, hydrated silica are inferior today to the best carbon black treads. It might be expected that mixtures of black and this type of silica would lose in resistance to abrasion in direct proportion to the amount of silica present, but this does not seem to be the case. Abrasion resistance of these mixtures is not a straight line function of the amounts of each reinforcing pigment present. Instead, the abrasion resistance of certain mixtures lies much closer to that of an all-black tread than would be expected. In addition, the hand tear resistance[1] of the black-silica mixtures is better than that of the all-black stock.

The value of hand tear resistance is not easily defined. But if it can be had at little or no sacrifice of abrasion resistance, it may be of importance to compounders seeking improved cutting and chipping resistance.

A few experimental tires have been made which indicate that replacement of part of the black in a tread with silica does not necessarily reduce abrasion resistance. Admittedly, these tires are very few in number, and the results available are sketchy. In spite of this condition, the subject appears to be of sufficient importance to justify calling it to the attention of tire compounders even at this early point in the development. Further justification is added by the appearance of a new fine silica, Hi-Sil 233,[2] which delivers in the northern states at a price which is about the same as the delivered price of HAF black.

Carbon Black-Silica Tear Is Knotty

The tear resistance of rubber stock containing carbon black and Hi-Sil is knotty. This is difficult to illustrate with the numerical results obtained in any of the common machine methods of measuring tear strength. All of the customary test methods give a maximum figure for pounds pull. They do not indicate what happens after this point is reached.

A compound may tear smoothly and quickly once its maximum resistance is reached, with the force required to maintain the tear being much less than that required to initiate it. In other compounds a tear will proceed only for a short distance when it is stopped by a knot, and the applied force must again build up to the maximum before the tear continues. In the latter type of compound, tearing proceeds by jerks, with the tearing force going through a series of maximums, all of which are about the same as the initial tearing force. Machine tear methods used today report only one maximum figure and do not indicate whether resistance has been encountered only once or a number of times.

Obviously, knotty tear is desirable in rubber compounds. A rubber article which is cut or torn in service is rendered useless if the resulting tear progresses entirely through it. If the tear is stopped in a short distance, the article continues to be serviceable.

The reason for the excellent knotty tear of carbon black-fine silica compounds is not readily explained at present. Another phenomenon which, at first glance, appears to be wholly unrelated may have some bearing on the matter.

Thus, addition of fine silica to either natural rubber-carbon black masterbatches or to GR-S-carbon black masterbatches greatly restricts the swell and prevents the dissolution of these masterbatches in organic solvents such as toluene. The fine silica obviously changes the natural rubber-carbon black and GR-S-carbon black systems in some way. The whole system is apparently more tightly bound together and thus is able to resist more strongly the swelling action of solvents.

Tank Tread Compounds

The apparent advantage of silica in carbon black-rubber stocks has shown up in laboratory tests of tank tread block compounds. These blocks rarely fail from the sort of abrasion that wears out passenger-car tires.

---

[1] "Columbian Colloidal Carbons," Vol. 4 (1943). Columbian Carbon Co., 380 Madison Ave., New York 17, N. Y.

[2] Columbia-Southern Chemical Corp.

Instead, they usually become cut or chipped to such an extent that they must be replaced. Some of the carbon black compounds used for this purpose have had much higher tensile strength and abrasion resistance than has actually been needed, but have been deficient in resistance to chipping or have had unsatisfactory hysteresis properties.

A series of tank track-type compounds was run. These were based on low-temperature GR-S polymer and contained various mixtures of SAF black and Hi-Sil 202.[1] Loadings were higher than are normally used in pneumatic tire treads because these compounds must have a high hardness to resist deflection under the heavy load they carry. From the standpoint of resistance to hand tear one of the best of these was a compound in which 10 parts of the normal 60 PHR loading of SAF black was replaced by an equal volume (10.8 parts) of Hi-Sil 202. The physical properties of this stock and of the control are shown in Table 1.

TABLE 1. SAF BLACK *VS.* SAF BLACK-HI-SIL 202 IN GR-S TANK TRACK-TYPE COMPOUND

Formulae	A	B
GR-S 1500	100	100
SAF Black	60	50
Hi-Sil 202	—	10.8
Zinc oxide	3	3
Sulfur	1.75	1.75
Santocure*	1.25	1.25
DOTG	—	0.3
Flexamine†	1	1
Triethanol amine	—	0.25
100° C. m.p. coumarone resin	—	2
Process oil	5	5
Stearic acid	1.5	1.5

Compound	Min. Cure at 315° F.	Modulus, Psi. 300%	400%	Tensile, Psi.	Elongation, %	Duro. Hard. 0 Sec.	30 Sec.	Tear Lbs./In.	Hand Tear
A	15	1380	2170	3260	570	72	62	400	
	20	1900	2920	3870	520	74	65	360	
	25	2080	3220	4080	500	75	66	350	Smooth
	30	2240	3420	3990	460	74	67	320	
	35	2310	3500	3080	460	76	68	340	
B	15	1160	1940	3490	610	70	60	380	
	20	1520	2450	3700	540	73	64	380	
	25	1760	2820	3860	510	75	66	330	Knotty
	30	1820	2910	3870	500	74	66	330	
	35	1860	2920	3730	490	73	66		
				Oven Aged—7 Days at 158° F.					
A	25	3500		3590	310	82	73		
	35	3520		3530	300	81	74		
B	25	2910		3620	355	83	74		
	35	2860		3570	350	82	74		

* Monsanto Chemical Co., Rubber Service Department, Akron, O.
† Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

It will be noted that the LTP GR-S compound containing the SAF-Hi-Sil 202 combination has good tensile strength and tear resistance; modulus at 400% elongation is well up; aged elongation is slightly better than the control; and aged tensile and hardness are practically identical. The hand tear resistance is better than that of the control.

A tank tread containing blocks made from Compound B has been under test by the U. S. Army at Aberdeen, Md., for some time. The author has no information about the performance of this particular tank tread.

Off-the-Road Treads

In this country passenger tires seldom encounter conditions that make it necessary for treads to have exceptional resistance to cutting and chipping. Consequently not too much interest is shown in the possibility of improving the chipping resistance of LTP GR-S passenger-tire treads.

Ability to resist chipping and cutting is of major importance, however, in the case of tires designed for off-the-road service in mines, quarries, logging camps, and similar places and on earth movers and road building equipment. Natural rubber is still the preferred polymer for such tires.

For this reason a considerable amount of additional work was done in the laboratory to see if combinations of carbon blacks with Hi-Sil 202 appeared to be of any interest for natural-rubber tread compounds. Examination of various mixtures with HAF black led to the conclusion that volume replacement of about 20 parts of black in a 50 PHR loaded compound resulted in little, if any, decrease in physical properties and a definite increase in resistance to hand tear. Rebound of the compound containing the mixture was somewhat higher, and its heat buildup was slightly lower. Physical properties of such a compound and of an all-black control are shown in Table 2 (which appears on the following page).

German Tire Test

Tires were built in the laboratories of Farbenfabriken Bayer Aktiengesellschaft at Leverkusen, Germany, with compounds similar to those shown in Table 2. There were small differences, however, made necessary because of differences in available materials.

For example, CK-3 black was used instead of HAF. This is produced domestically in Germany from anthracene residues and is only slightly inferior to HAF.

Fig. 1. Measuring tire air pressure during tire road tests made by an independent testing laboratory in Texas

TABLE 2. HAF BLACK VS. HAF BLACK-HI-SIL 202 IN NATURAL RUBBER TREADS

Formulae	C	D
#1 Smoked Sheets	100	100
HAF Black	50	30
Hi-Sil 202	—	21.6
Zinc oxide	5	5
Sulfur	2.5	2.5
Santocure	0.5	0.62
DOTG	—	0.48
Flexamine	1	1
PBNA	1	1
Triethanolamine	—	0.2
Paraflux 2016*	3	3
Stearic acid	3	3
Mooney scorch, small rotor, 250° F.	23¾'	19¾'

*C. P. Hall Co., Akron, O.

Compound	Min. Cure at 287° F.	Modulus, Psi. 300%	Tensile, Psi.	Elongation, %	Shore Hard.	Tear Lbs./In.
C	15	1380	3450	540	57	620
	30	2110	4080	500	63	650
	45	2160	4030	500	63	640
	60	2160	3940	470	64	570
D	15	1380	3730	590	62	830
	30	1590	3670	540	65	750
	45	1600	3590	530	66	740
	60	1700	3620	530	66	720
		After 14 Days at 158° F. in Circulating Air Oven				
C	30	2690	3450	380	66	530
	45	2540	3360	380	67	390
	60	2520	2950	350	67	300
D	30	2100	2580	360	68	540
	45	2080	3090	420	67	590
	60	2310	3360	430	71	560

	Cure at 280° F.	Rebound		ΔT° F. Goodrich Flexometer (0.375-In. Stroke; 175 Psi. Load)	
		Orig.	14 Days at 158° F.	Orig.	14 Days at 158° F.
C	75	48.0	47.5	49	50
	150	47.8	47.5	53	52
D	75	51.0	52.0	47	37
	150	50.4	51.9	51	46

The exact recipes and physical properties of the compounds used in making up the tires in Germany are shown in Table 3.

Tires were made with treads of these compounds and were tested at the Nurburgring, near Adenau in the Rhineland-Pfalz district of Germany. This is a track where one of the important European road races is held. Tests of tires, fuels, and lubricants are conducted at the Nurburgring because of the extreme severity of the conditions. Although the track is only 14.17 miles long, it contains 163 curves. When run at high speed, a first-grade carbon black tire can be worn smooth in a few hundred miles.

Results of this test have already appeared in a German publication,[3] although the silica, which was Hi-Sil 202, was not identified. Since this publication is not easily available, the results are repeated here for convenience.

After a 348-mile test, the tread containing only CK-3 black had a weight loss of 380 grams, and the tread loaded with 30 CK-3 and 20 of Hi-Sil 202 had lost 390 grams weight. A German Silica, Vulkasil S, tested at the same time in the same Formula F lost 460 grams (not shown in Table 3). A tire having a tread loaded only with Hi-Sil 202 lost 640 grams. Another tire having a tread loaded only with the German silica was definitely inferior, having a weight loss of 800 grams.

Looking only at the result obtained with the all-black compound and that obtained with the all Hi-Sil 202 compound, it would hardly have been predicted that a 30-20 combination of the two would run so close to the performance of the all-black tire.

U. S. Tire Tests

Meanwhile construction of experimental tires with treads corresponding to Compounds C and D had gone ahead in the United States. Two 8.00-15 tires were made, each having a tread section of Compound C and

[3] *Kautschuk u. Gummi*, Oct., 1954, p. 212 WT.

a section of Compound D. These tires were run during the month of May, 1954, at San Antonio, Tex., by Automotive Research Associates. The tires were tested under B-6 conditions, that is, 26 pounds' inflation, 1,380 pounds' load, and were rotated regularly.

The results of this road test are shown in Table 4.

Here again the tread loaded with a combination of 30 parts HAF and 21.6 parts Hi-Sil 202 gave almost the same wear as that loaded with 50 PHR of HAF.

Although tensile sheets made from Compound D exhibited better resistance to hand tear than did the all-black Compound C, no difference could be noted in cutting or chipping resistance after the 13,594-mile road test. Since the test was run all the way on pavement, this result is not unexpected.

TABLE 3. CK-3 BLACK *VS.* CK-3 BLACK-HI-SIL 202 IN NATURAL RUBBER TREADS

Formulae	E	F
#1 Smoked Sheets	100	100
CK-3 Black	45	30
Hi-Sil 202	—	20
Zinc oxide	3	3
Sulfur	2.5	3
Accelerator CZ	0.6	—
MBTS	—	0.8
Antioxidant 4010	0.75	1.25
PBNA	0.75	0.75
Amine activator	—	0.5
Paraffin	0.6	0.6
Pine tar	2.5	1
Stearic acid	3	3

The fact established was that the replacement of part of the black with a fine silica did not greatly reduce wear on the road. From this point the next step, of course, is to see if the better hand tear resistance of the black-silica mixture means better chipping resistance in off-the-road service. Work currently under way aimed at helping answer this question involves two 14.00 tires in which carbon black-Hi-Sil compound will be compared with an all-black "off-the-road" compound in two-way tread tires on a Diesel vehicle in a limestone mine.

Concurrently with the work on HAF black-Hi-Sil 202 combinations, similar tests were made on combinations of SAF black with Hi-Sil 202. Physical properties of one such combination and of an all-SAF control are shown in Table 5. Again it will be noted that rebound of the compound containing the mixture was higher and its heat buildup was slightly lower than that of the all-black stock.

Two additional 8.00-15 tires were made, each having a tread section of Compound G and a section of Compound H. These tires were run by Automotive Research Associates at San Antonio in May, at the same time as the HAF-Hi-Sil 202 tests previously mentioned and under the same test conditions.

The results of this road test are shown in Table 6.

It will be noted that the tread loaded with a combination of 35 parts SAF black and 10.8 parts Hi-Sil 202 gave almost the same wear as the straight carbon black tread. Again, no difference in cutting or chipping could be noted even though the black-silica combination had better resistance to hand tear.

Compound	Min. Cure at 290° F.	Mod., Psi. 300 %	Ring Tensile, Psi.	Elongation, %	Duro. Hard.	Rebound	Ring Tear Kg./Mm.
E	10	880	3130	635	58	46	28.5
	20	1065	3710	605	63	46	32.5
	30	1365	3770	630	63	46	32.0
	40	1365	3700	615	63	45	32.0
	60	1220	3625	585	63	45	28.5
F	5	665	2500	575	50	46	17.5
	10	1250	3695	585	60	54	31.5
	20	1480	3595	550	62	56	34.0
	30	1435	3500	535	62	56	31.0
	40	1410	3525	535	62	54	29.5
	60	1335	3440	530	62	54	31.5

TABLE 4. TIRE ROAD TESTS FOR COMPOUNDS C AND D

Compound	Loading	Measured in:	Miles/0.001-Inch Loss of Tread Depth At 4,358 Mi.	At 13,594 Mi.	Rating
			Tire 1		
C	50 HAF Black	Center	79.6	117.2	
		Shoulder	82.5	105.4	
		Average	81.0	111.3	100
D	30 HAF Black	Center	90.8	118.2	
	21.6 Hi-Sil 202	Shoulder	75.6	100.0	
		Average	83.2	109.1	98
			Tire 2		
C	50 HAF Black	Center	78.2	108.8	
		Shoulder	81.0	108.8	
		Average	79.6	108.8	100
D	30 HAF Black	Center	87.3	113.3	
	21.6 Hi-Sil 202	Shoulder	79.6	87.1	
		Average	83.4	100.2	95.2

Fig. 2. Tire tread depth measurements are made frequently during road tests

TABLE 5. SAF BLACK VS. SAF BLACK-HI-SIL 202 IN NATURAL RUBBER TREADS

Comparison of Natural Rubber Compounds Loaded with 45 PHR of SAF Black and with a Combination of SAF and Hi-Sil 202

	Formulae	
	G	H
#1 Smoked Sheets	100	100
SAF Black	45	35
Hi-Sil 202	—	10.8
Zinc oxide	5	5
Sulfur	2.5	2.5
Santocure	0.45	0.49
DOTG	—	0.21
Flexamine	1	1
PBNA	1	1
Triethanolamine	—	0.18
Paraflux 2016	6	6
Stearic acid	3	3
Mooney scorch	Over 30'	21½'

Compound	Min. Cure at 287° F.	Mod., Psi. 300 %	Tensile, Psi.	Elongation, %	Shore Hard.	Tear Lbs./In.
G	15	530	3090	680	56	470
	30	1040	4140	650	61	850
	45	1190	4200	620	62	880
	60	1320	4350	620	63	880
H	15	820	4070	670	57	860
	30	1160	4330	620	61	890
	45	1230	4160	600	63	750
	60	1280	4130	600	62	740
		After 14 Days at 158° F. in Circulating Air Oven				
G	30	1940	3470	490	70	550
	45	1830	3160	470	71	440
	60	1970	3700	500	71	450
H	30	1800	3720	510	67	700
	45	1820	3490	490	67	590
	60	1560	3190	500	66	430

		Rebound		△T° F. Goodrich Flexometer (0.375-In. Stroke; 175 Psi. Load)	
Compound	Cure at 280° F.	Orig.	14 Days at 158° F.	Orig.	14 Days at 158° F.
G	90	43.8	44.8	67	63
	180	43.9	44.1	70	64
H	90	47.6	48.2	57	53
	180	47.0	47.2	62	58

TABLE 6. TIRE ROAD TESTS FOR COMPOUND G AND H

Miles/0.001-Inch Loss of Tread Depth

Compound	Loading	Measured in:	At 4,158 Mi.	At 13,214 Mi.	Rating
		Tire 3			
G	45 SAF Black	Center	75.6	109.2	
		Shoulder	92.4	112.0	
		Average	84.0	110.6	100
H	35 SAF Black	Center	70.5	104.9	
	10.8 Hi-Sil 202	Shoulder	88.5	105.7	
		Average	79.5	105.3	95.2
		Tire 4			
			At 4,538 Mi.	At 12,679 Mi.	
G	45 SAF Black	Center	92.6	95.8	
		Shoulder	82.5	119.6	
		Average	87.5	107.7	100
H	35 SAF Black	Center	84.0	105.7	
	10.8 Hi-Sil 202	Shoulder	82.5	104.8	
		Average	83.3	105.2	97.6

TABLE 7. HAF BLACK VS. HAF BLACK-HI-SIL 233 IN NATURAL RUBBER TREADS

	Formulae		
	I	J	K
#1 Smoked Sheets	100	100	100
HAF Black	50	35	30
Hi-Sil 233	—	16.2	21.6
Zinc oxide	5	5	5
Sulfur	2.5	2.5	2.5
Santocure	0.5	0.5	0.62
DOTG	—	0.2	0.48
Triethanolamine	—	—	0.20
Flexamine	1	1	1
PBNA	1	1	1
Paraflux 2016	3	3	3
Stearic acid	3	3	3
Mooney scorch, small rotor, 250° F.	25'40"	27'35" 3	21'

Carbon Black-Hi-Sil 233 Treads

Earlier, mention was made of a new silica, Hi-Sil 233, which is lower priced than Hi-Sil 202. Direct comparisons between these two silicas in the same tires have shown 233 to give 10 to 17% better wear than 202 in all silica loaded tread compounds.

Work on combinations of HAF black with Hi-Sil 233 indicates that the newer silica, like its predecessor, can be used to increase hand tear resistance of carbon black compounds without much loss of abrasion resistance. This is particularly interesting because the pound cost of Hi-Sil 233 delivered in Akron, O., is almost identical with the delivered pound cost of bulk HAF black in hopper cars in the same area.

Compound	Min. Cure at 287° F.	Mod., Psi. 300%	Tensile, Psi.	Elongation, %	Shore Hard.	Tear Lbs./In.
I	15	1590	3695	560	58	640
	30	2035	3990	515	62	800
	45	2145	3995	500	64	670
	60	2125	3845	485	65	620
J	15	1250	3720	590	56	620
	30	1630	3890	560	59	750
	45	1730	3810	520	61	610
	60	1510	3720	540	59	640
K	15	1570	4040	590	59	750
	30	1710	3980	540	61	690
	45	1780	3890	520	61	720
	60	1660	3800	540	63	590

Compound	Min. Cure at 280° F	Rebound	△T° F. Goodrich Flexometer (0.375-In. Stroke; 175 Psi. Load)
I	75	49.0	47
J	75	51.4	45
K	75	53.8	38

TABLE 8. TIRE ROAD TESTS FOR COMPOUNDS I, J, AND K

Compound	Loading	Measured in:	Miles/0.001-Inch Loss of Tread Depth 4,560 Mi.	9,120 Mi.	13,680 Mi.	Rating
			Tire 5			
I	50 HAF Black	Center	99.1	103.6	103.6	
		Shoulder	147.0	140.3	139.5	
		Average	123.0	121.9	121.5	100
J	35 HAF Black 16.2 Hi-Sil 233	Center	99.1	109.8	112.1	
		Shoulder	126.6	121.6	127.8	
		Average	112.8	115.7	119.9	98.6
			Tire 6			
I	50 HAF Black	Center	120.0	108.5	113.0	
		Shoulder	134.1	128.4	131.5	
		Average	127.0	118.4	122.2	100
J	35 HAF Black 16.2 Hi-Sil 233	Center	108.5	99.1	103.6	
		Shoulder	190.0(?)	132.1	138.1	
		Average	——	115.6	120.8	98.8
			Tire 7			
I	50 HAF Black	Center	106.0	120.0	114.0	
		Shoulder	152.0	138.1	126.6	
		Average	129.0	129.0	120.3	100
K	30 HAF Black 21.6 Hi-Sil 233	Center	103.6	120.0	116.9	
		Shoulder	130.2	123.2	116.9	
		Average	116.9	121.6	116.9	97.1
			Tire 8			
I	50 HAF Black	Center	114.0	109.8	112.1	
		Shoulder	138.1	134.1	139.5	
		Average	126.0	121.9	125.8	100
K	30 HAF Black 21.6 Hi-Sil 233	Center	106.0	120.0	115.9	
		Shoulder	130.2	124.9	134.1	
		Average	118.1	122.4	125.0	99.3

Physical properties of two HAF black-Hi-Sil 233 mixtures are shown in Table 7. The results of a road test run in San Antonio during January and February of this year are shown in Table 8; the tires are identified as numbers 5, 6, 7, and 8. These were 8.00-15 tires tested at 60 miles per hour, 1,380 pounds' load and 24 pounds' inflation. This inflation was two pounds less than that used for the first four tires reported above. Tires 5 through 8 were built and cured in a different factory than tires 1 through 4 and consequently had a different tread design and profile. When experimental tires made at the second plant were tested at 26 pounds' pressure, there were very large differences between measurements of wear in the center of the tread and at the shoulder. Tires were then built with the same experimental compounds and tested at 24 pounds with the results shown in Table 8.

Summary and Conclusions

As a result of some tire road tests, which admittedly are not extensive, it appears that mixtures of carbon black with Hi-Sil 202 and Hi-Sil 233 exhibit synergistic reinforcing effects; that is, the tire tread wear is not a straight line function of the Hi-Sil loading. Instead, the tire tread wear of certain carbon black-Hi-Sil mixtures in natural rubber is closer to that of all-black compounds than would have been predicted from the known performance of all-Hi-Sil compounds.

Compounds containing carbon black-Hi-Sil mixtures also appear to possess greater resistance to hand tear than is shown by all-black compounds. A very knotty tear is exhibited by carbon black-Hi-Sil mixtures instead of the smoother tear characteristic of carbon black stocks.

The importance of resistance to hand tear is not known, but it is possible that it may be related to the ability of the compound to resist cutting and chipping.

Since substitution of Hi-Sil for part of the carbon black in a natural rubber tread compound does improve hand tear resistance, it is possible that use of carbon black-Hi-Sil mixtures may result in improved tires for off-the-road service.

•

Ozone Crazing

(*Continued from page 62*)

tected by covering with tape to prevent greater ozone attack at these points. The specimens were then exposed, while in the stressed condition, in an ozone cabinet[4] in the dark, at a concentration of 25 ±5 pphm ozone at a temperature of 100 ±2° F. One specimen was also exposed outdoors. The specimens in the ozone cabinet were examined periodically at 20 magnifications for visual evidence of cracking, and the outdoor specimen was examined at five magnifications.

[4] ASTM Method D1149-51T, "ASTM Methods for Rubber Products, December 1952." American Society for Testing Material, 1916 Race St., Philadelphia, Pa.

TABLE 1. COMPOUND FORMULATION

GR-S 1505	100
Philblack A*	50
Zinc oxide	3
Stearic acid	2
Neozone D†	1
Agerite Resin D‡	1
Santocure§	1
Sulfur	1.75
Cure: 30 minutes @ 307° F.	

* Phillips Chemical Co. Akron, O.
† E. I. du Pont de Nemours & Co. Wilmington, Del.
‡ R. T. Vanderbilt Co. New York, N. Y.
§ Monsanto Chemical Co. St. Louis, Mo.

Results and Discussion

An examination of Figure 1 *(top and middle)* will indicate that the typical "crazing" type of cracking is present in the areas of the specimen which are under biaxial stress; while the typical ozone cracking is present where the specimens are under only uniaxial stress. As shown in Figure 1 *(bottom)*, the same types of cracking occur in a specimen exposed four days outdoors. For comparison, a photograph of a badly "crazed" tire sidewall is furnished in Figure 2. It is evident that the experimentally produced "crazing" is identical with that produced in tire sidewalls during service.

Conclusion

Typical "crazing" of stressed GR-S vulcanizates can be produced by exposure of biaxially stressed specimens to ozone in the absence of light.

Acknowledgment

The authors wish to express their appreciation to the Ordnance Corps, United States Army, for permission to publish this paper.

•

Reports Technological Growth

American universities granted 4,631 doctoral degrees in science in 1953, compared to 102 in 1900, according to the fourth annual report of the National Science Foundation, documenting the growth of technocracy here. In 1945, however, with most of the nation's manpower involved in pursuits of war, only 833 such degrees were issued. This lapse is a contributing cause of the current deficiency of scientific personnel, the Foundation points out.

•

Correction

The first sentence in the summary of the article by Bryant and Bisset, which appeared on page 640 of our February, 1955, issue, mentioned mineral fillers of "greater than one millimicron"; whereas this should have read "greater than one micron." The particle sizes dealt with in this work were of an order of magnitude greater than reinforcing carbon blacks and silicas.

EDITORIALS

Free Synthetic Rubber Industry Has Promising Future

Production, marketing, and distribution of synthetic rubber in the United States are finally to become entirely a private industry operation with the rejection by Congress on March 23 of all objections to the recommendations of the Rubber Producing Facilities Disposal Commission for the sale of the government owned plants to private industry. Both the Disposal Commission and the rubber industry deserve much credit for their untiring efforts during the last several months and particulary during the final push which began with the hearings in Washington in March. The policy enumerated in the Rubber Act of 1948, "that the security interests of the United States can and will best be served by the development within the United States of a free, competitive synthetic rubber industry," is now an established fact.

The next most important consideration, now actual instead of academic, is the outlook for this industry under private industry operation.

Increased Demand Expected

During the past few years many persons in both industry and government have predicted a continued increase in the use of synthetic rubber in the United States and abroad during the next ten to twenty years. One of the most recent estimates was provided by Everett G. Holt, for many years an expert on the economic aspects of the rubber industry in the Department of Commerce, when he stated at the March Congressional hearings on the Disposal Commission's recommendations that total new rubber and the respective amounts of natural and synthetic likely to be consumed during the next five years would probably be as follows: 1955 total, 1,330,000 long tons, including 568,000 tons of natural and 762,000 tons of synthetics; 1956 total, 1,340,000, consisting of 520,000 natural, 820,000 synthetics; 1957 total, 1,380,000, including 510,000 natural, 870,000 synthetics; 1958 total, 1,420,000, of which 480,000 will be natural, 940,000 synthetics; and 1959 total, 1,460,000, including 450,000 natural, 1,010,000 synthetics.

More Capacity Planned

Industry witnesses before Congress during these same hearings expressed simular opinions regarding the growth of synthetic rubber consumption in the United States and abroad. John P. Coe, United States Rubber Co., stated that world demand for synthetic rubber in 1965 would be 40% above present capacity. J. E. Trainer, Firestone Tire & Rubber Co., said that his company expected to spend $1,200,000 immediately to expand the capacity of the plants it has purchased. L. E. Spencer, Goodyear Tire & Rubber Co., added that his company had already placed orders for equipment to expand the capacity of its plants, and W. S. Richardson, the B. F. Goodrich Co., said Goodrich-Gulf Chemicals had inaugurated engineering studies to increase the capacity of its plants and expected to spend $1,000,000 immediately in this connection.

Esso Standard Oil Co. and its affiliate, Humble Oil & Refining Co., stated it proposes to use its best efforts to advance Butyl rubber in competition with other types of synthetic rubber and with natural rubber and revealed that Polymer Corp., Ltd., of Canada, Goodrich-Gulf Chemicals, Inc., and Petroleum Chemicals, Inc., have all acquired licenses to produce Butyl rubber. Polymer Corp. has been producing Butyl rubber for 10 years, and Petroleum Chemicals is proceeding with the design of a plant of 46,500 tons annual capacity.

E. I. du Pont de Nemours & Co., Inc., began construction of a new plant in 1955 to increase capacity for the production of neoprene rubber.

Outlook Excellent

Continued growth of synthetic rubber production capacity in the United States is adequately documented, therefore, by the expansion plans of the producers of such rubbers. These plans would not have been made without conviction that demand will continue to increase.

Although the variety and types of what were previously known as government synthetic rubbers may be somewhat reduced at the start of private industry operation, competition within the industry is expected to provide for all real demands and, in addition, develop to greater commercial availability such other types as the polyurethane rubbers.

Only one word is needed to sum up the outlook for the synthetic rubber industry in the United States under private industry operation—excellent!

R. G. Seaman

EDITOR

Meetings and Reports

Rubber Division, A. C. S., Detroit Meeting Includes Contributed Papers and Plant Trips

The Division of Rubber Chemistry of the American Chemical Society will meet separate from the parent Society at the Sheraton-Cadillac Hotel in Detroit, Mich., May 4-6. In addition to an excellent program of technical papers to be presented at four sessions beginning on the afternoon of Wednesday, May 4, this meeting will be featured by two contributed papers, one on the economic aspects of the rubber industry by E. R. Bridgwater, E. I. du Pont de Nemours & Co., Inc., entitled "Profits," and the other by Harry L. Fisher, University of Southern California and The Los Angeles Rubber Group, Inc., on "Educational Activities of Rubber Groups."

Several plant trips of more than usual interest have been scheduled for Thursday afternoon, May 5. Members and guests may visit Chrysler Corp., Ford Motor Co., or the General Motors Technical Center, among the auto makers, or the Detroit Tank Arsenal, or view tire making at the United States Rubber Co. plant.

The technical sessions will begin Wednesday afternoon with Division Chairman John Ball, Midwest Rubber Reclaiming Co., presiding. Registration will start Wednesday morning, and a luncheon-meeting of the Division's 25-Year Club will take place at noon of the same day. A. E. Juve, of The B. F. Goodrich Co., and Division vice chairman, will preside at the Thursday morning session; while J. T. O'Reilly, Ford Motor, chairman of the local committee on arrangements, will preside at the session on Friday morning, May 6. John W. Snyder, Binney & Smith Co., Division director, will preside at the final session on Friday afternoon.

The business meeting of the Division will take place toward the end of the Thursday morning session, at which time nominating, membership, and other committees will make reports.

The Division banquet on Thursday evening is expected to include an outstanding figure from the industrial world of Detroit as a speaker, and entertainment.

The papers being presented at the first session on Wednesday afternoon are concerned with specialty rubbers and their compounding; the Bridgwater paper will also be given at this session. On Thursday morning most of the papers deal with the subject of rubber reinforcement, and Dr. Fisher will also present his paper at this time. The Friday morning session will include papers on the chemistry of the oxidation of rubber, peroxide vulcanization, and the reaction of ozone with rubber. Several papers on oil-extended rubbers are scheduled for the final session on Friday afternoon.

The local committee on arrangements is headed by Mr. O'Reilly, with the following men in charge of the several subcommittees: banquet, W. Wiard, Dow Corning Corp.; finance, H. Hoerauf, U. S. Rubber; housing, J. Craft; ladies' entertainment, W. Briscoe; publicity, W. Bauer, Brown Rubber Co.; plant trips, G. P. Hollingsworth, Minnesota Mining & Mfg. Co.; program and meeting rooms, E. Tillitson, Tillitson Rubber Co.; and registration and information, E. Kvet, Jr., Baldwin Rubber Co.

Program and Abstracts of Papers

Wednesday Morning—May 4

9:00 a.m. Registration.

12:00 noon. 25-Year Club Luncheon Meeting. E. J. Kvet, Chairman.

Wednesday Afternoon—May 4

J. M. Ball, Presiding

2:00 p.m.—1. Introductory Remarks. J. M. Ball.

2:05 p.m.—2. Effect of Temperature on the Air Permeability of Silicone Rubber. John B. Gregory, Frederick S. Bacon Laboratories, Watertown, Mass.

Using a simplified apparatus for determining the permeability of rubber to air, a study has been made of the air permeability of various silicone rubber compounds at 75 and 158° F.

In contrast to the carbon skeletal rubbers also tested, the silicone rubbers show little change in the rate of air permeability at the two temperatures. Data obtained on the physical properties of these compounds at the test temperatures are also given. The properties of the silicone rubber compounds in contrast to those of the other rubbers are shown not to be temperature-dependent.

Possible molecular structures of the different rubbers which explain these differences in the temperature dependence of their properties are discussed.

2:25 p.m.—3. Evaluation of Silicone Rubber Modified with Teflon. W. H. Crandall, Bacon Laboratories.

Various silicone rubber compounds containing dispersed Teflon resin in quantities up to 14 parts per 100 of rubber (PHR) were evaluated.

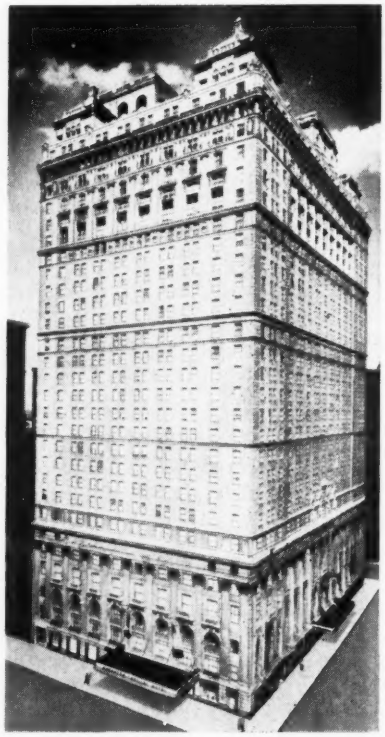
The tear strength of every class of silicone rubber is improved by a factor of two to five with no decrease in other physical properties. No significant difference in tear values is noted when samples are tested parallel to and perpendicular to the direction of grain of the rubber.

Contrary to data reported elsewhere, no marked improvement is found in the resistance of the Teflon-filled silicone rubber to swelling in various media over that of the unmodified silicone rubber; however, the aging characteristics at elevated temperature of the Teflon-modified silicone rubber are superior to those of the unmodified rubber.

Although the incorporation of Teflon does much toward improving certain properties of silicone rubber, much difficulty arises in molding the stocks. The flow of the freshly milled, uncured Teflon-filled compound is poor because of its inherent nervy structure, thus limiting size and shape of molded articles. The finished part molded from Teflon-filled silicone rubber exhibits a slightly uneven surface after oven curing. The degree of unevenness is determined by the initial nerve of the particular rubber used.

Teflon-filled silicone rubber is recommended for use wherever ordinary silicone rubbers fail because of their poor tear characteristics.

2:50 p.m.—4. "Adiprene" B Urethane Rubber. I. Properties of the Raw Polymer and Its Vulcanizates. F. B. Hill, C. A.



Sheraton-Cadillac Hotel

Young, J. A. Nelson, R. G. Arnold, Contribution No. 186 of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

"Adiprene" B urethane rubber is prepared by block condensation polymerization. The raw elastomer resembles commercial diene hydrocarbon polymers in general physical characteristics, but differs greatly in being considerably tougher for a given molecular weight. The polymer can be processed on conventional rubber equipment despite its higher viscosity. The product is stable to storage and soluble only in highly polar solvents. Though polar in character, it is not notably more hygroscopic than conventional hydrocarbon polymers. This polyurethane elastomer can be cured with diisocyanates. Data are presented on various organic isocyanate vulcanizing agents such as 3,3'-diisocyanate-4,4'-dimethylcarbanilide, and 4,4'-methylene-di-o-tolylisocyanate.

"Adiprene" B urethane rubber gum vulcanizates have high tensile strength, good resilience, and excellent low-temperature properties. Certain physical properties of "Adiprene" B are improved by carbon black. Properly compounded "Adiprene" products are extremely resistant to oxygen, ozone, and abrasion.

3:10 p.m.—5. "Adiprene" B Urethane Rubber. II. Factors Influencing Its Processability. J. S. Rugg and G. W. Scott, du Pont.

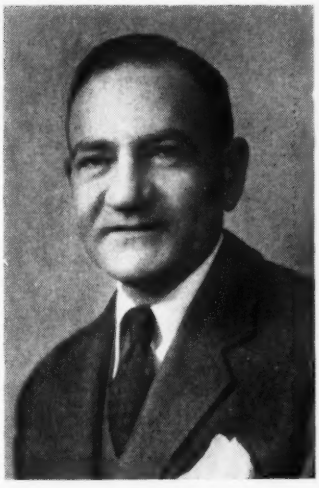
Few discoveries in the field of elastomers have created as much interest as the recent development of the urethane rubbers with their well-known properties of high tensile strength, tear resistance, and abrasion resistance. Most solid urethane rubbers, however, can be processed on existing industry equipment only with difficulty and with changes in conventional processing methods. A new solid urethane rubber has been developed which appears to have a greater degree of processability than other urethane rubbers.

This paper discusses both the basic principles and some of the practical aspects of the processing of "Adiprene" B urethane rubber. The criteria normally used for judging processability of elastomer compounds must be modified for use with "Adiprene" B compounds. Tests have shown that temperature is an even more controlling factor in the processing of "Adiprene" B stocks than it is with those of the more familiar elastomers. Mooney viscosity measurements at several rotor speeds indicate that this urethane rubber may be thixotropic and that its processing characteristics depend on the rate of shear. Incipient vulcanization (scorch) is another phenomenon which manifests itself differently in this urethane rubber than in other elastomers. Methods of recognizing and controlling the phenomenon are discussed.

3:35 p.m.—6. "Profits." E. R. Bridgwater, du Pont. A contributed paper.

3:55 p.m.—7. 2-Methyl-5-Vinylpyridine Elastomers in Oil Resistant Service. J. F. Svetlik, H. E. Railsback, W. T. Cooper, Phillips Petroleum Co., Bartlesville, Okla.

Butadiene-2-methyl-5-vinylpyridine copolymers and butadiene-acrylonitrile-2-methyl-5-vinylpyridine terpolymers possess excellent oil resistance when quaternized with organic halo-compounds. Oil resistance is proportional to the pyridine content of the rubber and the type and quantity of quaternizing agent employed. Black reinforced stocks exhibit excellent resistance to blowout in applications involving rapid cycling deformation.



John M. Ball

The copolymers of butadiene and 2-methyl-5-vinylpyridine possess excellent flexibility at low temperatures and serviceability at high temperatures. Low volume swell and excellent retention of tensile strength characterize the vulcanizates after immersion in esters at elevated temperatures. This new type of rubber also performs well in contact with hydrocarbons, alcohols, glycol, ketones, and acid and caustic solutions. The terpolymers exhibit low volume change after immersion in aromatic test fluids.

4:20 p.m.—8. The Effect of Cure on Aging and Low-Temperature Properties of Nitrile Rubbers. W. J. Mueller and P. B. Stickney, Battelle Memorial Institute, Columbus, O.

The problem of oil resistance and low-temperature serviceability of elastomers has become one of great importance in the last 15 years. While all of the answers in this field are not known, it has been established that, in general, these are conflicting properties. That is, when a polymer of improved oil resistance is developed, it has relatively poor low-temperature properties.

To some extent the same generalization holds for many compounding effects. Recent military requirements, particularly those involving aircraft components, have added a third facet to this problem. For example, elastomers are needed that have a combination of oil resistance, low-temperature serviceability, and resistance to deterioration in high-temperature service.

A study has been made of the effect of the type and degree of cure on these critical properties in certain butadiene-acrylonitrile copolymers. It has been shown that the thiuram disulfide type of low-sulfur recipe gives improved low-temperature serviceability after aging as well as improved room-temperature properties. It is also shown that the extent of cross-linking has a small, but definite effect on the TR-70 value; that is, on the low-temperature serviceability, as indicated by this particular test. The significance of these variations is discussed.

4:45 p.m.—9. Compounding Acrylate Polymers for Resistance to a Di-Ester Lubricant at High Temperature.[1] W. J. Mueller and R. A. Clark, Battelle Institute.

Increased operating temperatures are being encountered in our faster flying aircraft. Conventional lubricants are not adequate for such applications and have necessitated the development of more heat-resistant synthetic lubricants. Among the most promising lubricants for this application is Turbo Oil-15, a di-ester base material. This paper pertains to compounding studies made with acrylate-type rubbers to develop their resistance to this fluid at 350° F. for a period of 500 hours.

The compounding variables studied in this research program included variations in type and amount of acrylate polymer, vulcanizing agents, fillers, lubricants, and antioxidants. The most promising results were obtained for a copolymer of ethyl acrylate and cholorethylvinyl ether, with less satisfactory results being obtained for polyethyl-acrylate and a copolymer of ethyl acrylate and acrylonitrile. The chief difficulty with these latter polymers was their tendency to crack after hot-oil aging.

The best hot-oil aged properties were evidenced when the curing system consisted of a careful balance of triethylene tetramine, sulfur, and tetramethyl thiuram disulfide. In an evaluation of a number of reinforcing fillers, the best performance was found for a calcium silicate pigment, Silene EF. Relatively high filler loadings and long curing times contributed to some reduction in rubber swell. A small amount of stearic acid was employed as a lubricant to improve processability. Neither plasticizers nor antioxidants appeared to offer any advantage in reducing swell or in improving the retention of original physical properties during hot-oil aging. The final product developed met all the minimum target requirements, except that the final swell after the 500-hour immersion test was 6% above the 30% maximum desired.

Thursday Morning—May 5

A. E. Juve, Presiding

9:00 a.m.—10. Reinforcement Studies of Synthetic Elastomers. I. The Effect of Mica Filler in Cured GR-S Rubber. A. Gaitan, G. W. Blum, E. G. Bobalek, Case Institute of Technology, Cleveland, O.

The study of mica as a reinforcing filler for synthetic rubber elastomers is an extension of previous studies designed to determine the nature of reinforcement and bonding. Mica was chosen as a partial replacement for reinforcing carbon black normally used in compounding because of mica's unusual physical character; even in small particle size it exhibits a platelet structure and slippage planes which contribute to the increase of elongation of the cured elastomers.

[1] Sponsored by the Wright Air Development Center, Wright-Patterson Air Force Base, Dayton, O.

Mica has a small but measurable reinforcing effect in cured GR-S rubber stock. The Wiegand ΔA^* function for mica is about one-third that of Statex K carbon black (VFF) over a comparable rate of pigment-volume concentration and at equivalent curing conditions. A study of the influence of curing time and mica loading is presented.

Blends of carbon black and mica show an average reinforcing effect essentially proportional to the properties of the individual components and the relative proportions of each reinforcing agent in the mixture. Statex K-mica mixtures show greater elongation than can be accomplished with Statex K alone, without sacrifice of tensile strength. The use of mica in combination with carbon black thus utilizes the softening effect of mica and minimizes or eliminates the need of additional compounding oils for the providing of elongation.

An interpretation of the reinforcing action of mica is suggested according to Wiegand's concept of a constant energy content-base mix as well as by Hartner's modification of actual rubber content in the final mixes.

9:15 a.m.—11. Reinforcement Studies of Synthetic Elastomers. II. Contributions of Carbon Black Reinforcing Effects to the Bonding of Butyl Rubber to Brass. T. H. Ling, E. G. Bobalek, G. W. Blum, Case Institute.

The nature of the bond existing between metal surfaces and vulcanized synthetic elastomers is investigated as a continuation of previous work. A Butyl rubber composition was varied by using different loadings of a successive series of carbon blacks which exhibited differences in particle size, particle shape, particle surface structure, and wettability. This group of seven carbon blacks included five furnace blacks in a particle size range of 100-275 Angstrom units of high roughness and porosity, and two high surface blacks which possess weak bonding ability. These rubber stocks were used to prepare brass-rubber adhesion specimens as well as tensile test specimens.

For most types of blacks used, an empirical equation was derived,

$$Z = \frac{1}{a}\left[\int \frac{V_1}{V_0} \int \frac{E_{B_1}}{E_0} TdEdV\right]^{1/2} + b$$

where a is a constant and b is the bonding strength of the pure rubber stock, which relates the tensile and modulus properties to the ultimate rupture strength of the adhesion specimens. This correlation prevailed only where the adhesive bond failed partially by cohesive break within the adhesive, rather than predominantly by the rupture at the brass-to-rubber interphase. This mechanism of bond failure is confirmed by qualitative observations as well as by qualitative correlation between the Wiegand ΔA function and the Z value.

While the two high surface area carbon blacks, Sterling A and Sterling 95, possess high tensile and modulus properties, they tend consistently to fail by adhesive rupture at low stresses in the adhesion specimens. These exceptions to the predictions from this empirical relation suggest the possibility that not all Butyl rubber compositions are able to form a strong adhesive bond by a chemical mechanism. This condition may be due to the adverse effects which some types of carbon exert upon the sulfur balance on the adhesive composition. In such instances the tensile rupture strength of the rubber is not the limiting circumstance which determines the bonding strength.

9:30 a.m.—12. Reinforcement Studies of Synthetic Elastomers. III. The Mechanism of Reinforcement: The Influence of Particle Size and Type on Tensile Behavior.[2] S. M. Skinner, E. G. Bobalek, G. W. Blum, T. H. Ling, Case Institute.

Various mechanisms of reinforcement, which have been suggested in the literature, are considered. The tensile behavior of Butyl and GR-S rubber reinforced by a number of carbon blacks and micas of different source and particle size is analyzed, both in terms of successive ΔA values and in terms of detailed stress-strain behavior. The number of apparent cross-links per unit volume as a function of the volume or weight percentage of filler provides support for a mechanism of reinforcement expressed in the case of Butyl rubber by an equation similar to that of Blanchard and Parkinson, and in the case of GR-S by additional cross-linking and an earlier departure from the James and Guth-Flory equation.

The observed differences in the effect of mica, of carbon black, and of mixtures of black and mica, on the tensile behavior of reinforced GR-S, are discussed. Reference is made to the theories of Buchan and of Bueche, and experimental support is presented for the latter, originating from a somewhat different method of determining the area per cross-link. The stiffness factor is computed for different extensions, and consistent behavior is obtained at break for different elongations and volume loadings.

In Butyl rubber the ratio of the apparent number of cross-links at break to that at 300% extension is found to be sensibly constant for different carbon blacks and different percentages of filler. Analogous behavior is obtained for the stiffness factor. A qualitative explanation of the effect of stiffness is given. The magnitude of the filler effect, as defined by Bueche, is found in the experiments on Butyl rubber to be roughly the same (to within a factor of five) in the carbon blacks of different manufacturers.

A. E. Juve

9:55 a.m.—13. Oxygen Containing Groups on the Surface of Carbon Black. Merton L. Studebaker and L. G. Nabors, Phillips Chemical Co., Akron, O.; E. W. D. Huffman, Huffman Microanalytical Laboratories, Wheatridge, Colo.; A. C. Wolfe, University of Akron, Akron.

Twelve commercial carbon blacks were treated with diazomethane. Analyses of the treated samples indicate the presence of phenolic, carboxylic, and 1,4-quinone types of oxygen. The amounts of the three types of oxygen vary among furnace blacks, ordinary rubber-grade channel blacks, conducting channel black, and color blacks.

Decarboxylation of channel black confirms the amount of carboxyl oxygen. Several types of reducing agents react with carbon black, and these tests are discussed in connection with the amount of 1,4-quinone type of oxygen. The significance of the results on the behavior of carbon black in rubber is treated very briefly.

10:20 a.m.—14. Abrasion of Butyl Rubber. R. L. Zapp, Standard Oil Development Co., Linden, N. J.

By the use of the Lambourn abrader a concept of abrasion has been proposed that fits the performance of a wide variety of compounds. The ability of this type of machine to give varying degrees of slip and braking forces has aided in the selection of the proper conditions for abrasion studies. By the use of a small tread pattern on the sample wheel laboratory, results are brought into closer agreement with actual road wear tests.

The work of Schallamach and the analysis of abrasion by a needle abrader have been extended to an abrasive surface. To the considerations of compound strength and surface friction or traction has been added the consideration of dynamic hardness. The abrasion of rubber has then been related to a ratio of dynamic modulus over rupture energy. Thus if a compound is made dynamically softer or more conformable without a sacrifice in its resistance to rupture, a superior abrading tread will result. In simple terms, what is needed for best abrasion resistance is the softest, toughest material.

Butyl owes its comparable or superior abrasion resistance (when compared to other rubbers) to the fact that its vulcanizates are dynamically softer. The heat treatment of Butyl-carbon black mixtures produces vulcanizates that are still softer in relation to their rupture energy. This advantage is the only one of such a mixing procedure. Other polymer and compounding variables that tend to *decrease* the ratio of dynamic hardness over rupture energy will improve abrasion resistance. These changes include increasing the molecular weight of the polymer and reducing somewhat the unsaturation.

* *Ind. Eng. Chem.*, 17, 939 (1925).

[2] With the partial support of the Office of Ordnance Research.

A certain quantity of plasticizer to increase softness and a reduction in the state of cure have been shown to be beneficial. The latter change produced by a reduction in the amount of sulfur in the compound, which limits the extent of cross-linking, has resulted in superior tire treads.

10:45 a.m.—15. Low-Temperature Evaluation of Tires. C. W. Banton, Jr., and C. F. Dandareau, Jr., Detroit Arsenal, Center Line, Mich.

It is the objective of the Department of the Army that all military vehicles be capable of satisfactory performance at temperatures ranging from —65 to +125° F. In addition, these vehicles must be operable after storage at temperatures ranging from —80 to +160° F.

Serviceability standards for some rubber products, hose seals, grommets, etc., are readily established in the laboratory on a relatively small scale. Interdependence of the various tire components necessitates testing of the complete tire to determine such factors as fatigue life, separation resistance, and brittleness. Installation of a Bureau of Standards type of tire test machine was possible in the extensive low-temperature test facilities at the Detroit Arsenal. This machine has been used as the basis for all performance evaluations.

Comparison of rayon and cotton cord passenger tires indicated superior fatigue resistance of cotton tires at intermediate temperatures (—13° F.). The failures which occurred with both cord types were similar to those experienced in the field. However, at —65° F. the rayon cord was satisfactory, but the cotton cord proved unsatisfactory.

The performance of military tires, both light and heavy duty, was satisfactory at —40° F. Power consumption was higher because of cold-stiffening and reduced inflation pressure. Lightweight inner tubes buckled at this temperature, and the heavy-duty tubes performed adequately. At —65° F., the performance of standard tires and tubes was generally unsatisfactory. Brittle failure of tread, sidewall, and carcass compounds occurred in almost every specimen not specifically designed for low-temperature performance. Satisfactory performance at both high and low temperatures was obtained with special GR-S polymers and with natural rubber.

Solid tires, for track-laying vehicles, performed adequately when subjected to moderately severe test conditions as —65° F., regardless of tire compound. Under extreme conditions the use of low-temperature polymerized GR-S, special butadiene-styrene-isoprene polymers, and special plasticizers was necessary to prevent brittle failure of the tires.

11:10 a.m. Business Meeting.

11:25 a.m.—16. Educational Activities of Rubber Groups. Harry L. Fisher, University of Southern California and The Los Angeles Rubber Group, Inc., Los Angeles, Calif.

Education activities are always worth while because they give young men a good start in their life work and train others to do better work. Activities of the local rubber groups, which are sponsoring some type of educational courses in rubber and

J. T. O'Reilly

in polymers in general and/or are providing scholarships and fellowships, will be described, and some information on future plans will be given.

The Los Angeles Rubber Group, Inc., (TLARGI), with which the author is associated, has received contributions of almost $100,000 from manufacturers of rubber goods and has collaborated with the University of Southern California in the establishment of courses in rubber chemistry and technology. The laboratory contains more than $65,000 worth of apparatus, all of which is used each year by students. All classes at present are in the evenings. Two advanced students in the laboratory are working for higher degrees. Plans are under way for obtaining more apparatus and for providing scholarships in rubber technology.

Thursday Afternoon—May 5

1:30 p.m. Plant Trips. Any one of the following places may be visited. Transportation by bus will cost $1. G. P. Hollingsworth, Minnesota Mining & Mfg. Co., of the local committee on arrangements, is in charge of this activity.

Chrysler Corp., Plymouth Division and Chrysler Engineering Laboratories. This trip will include the Mechanical Laboratories (transmission, brake and fatigue tests), Rubber Laboratory, Electric Sound Laboratory, Research Laboratory, and the Engineering Department at the Highland Park Engineering Laboratories, and a tour of the assembly line at the Plymouth Division.

Detroit Tank Arsenal. The Engineering, Research, and Development Laboratories, Experimental Vehicle Department, and the Test Track are features of this tour.

Ford Motor Co. The Rouge plant, including the steel mill, body press shop, and final assembly, comprises this tour.

United States Rubber Co. "Tires in the Making."

General Motors Technical Center. This new Engineering and Research Center covers hundreds of acres and has only recently been open to visitors.

7:00 p.m. Division Banquet.

Friday Morning—May 6

J. T. O'Reilly, Presiding

9:00 a.m.—17. Chain Scission in the Oxidation of *Hevea* Rubber. I. E. M. Bevilacqua, United States Rubber Co., General Laboratories, Passaic, N. J.

Measurements have been made of the efficiency of chain scission of unvulcanized rubber by molecular oxygen at elevated temperatures. The efficiency increases with increasing temperature, reaching a limit at 140° C. of about 0.17-scission per mole of oxygen absorbed. This limit is consistent with a reaction scheme based on the structure of the primary oxidation product of 1,5 dienes postulated by Bolland and Hughes.

Comparison of these results with those of Tobolsky, Metz, and Mesrobian leads to the suggestion that deterioration of vulcanized rubber by oxygen may involve direct attack at the point of cross-linking.

9:10 a.m.—18. Chain Scission in the Oxidation of *Hevea* Rubber. II. E. M. Bevilacqua.

The chemistry of the reaction leading to chain scission of *Hevea* rubber by molecular oxygen has been a problem for many years. Study of the oxidation of *Hevea* rubber latex has shed new light on this problem.

As a result of early work on rubber oxidation, it is known that water, carbon dioxide, and formic acid are products of the reaction. Since ammonia-preserved latex is an effective trap for acidic products, it has been possible to obtain reasonably quantitative estimates of the yields of these and to identify acetic acid as a further product.

These results may be combined with an estimate of the efficiency of scission by oxygen, to yield experimental ratios of acids produced to chain scissions:

Acid	Moles/Mole Scissions
CO_2	2.02 (2)
CH_3CO_2H	0.92 (1)
HCO_2H	0.83 (1)

These ratios correspond to the loss of five carbon atoms per scission of the hydrocarbon chain. An explanation for the destruction of an entire isoprene unit can be obtained if it is assumed that the initial rubber oxidation product has the same structure as that of squalene and other low molecular weight polyisoprenes.

9:30 a.m.—19. Emulsion Polymerization of Chloroprene—III. Molecular Weights and Film Vulcanizate Properties. Maurice Morton and Irja Piirma, University of Akron.

A study has been conducted on the emulsion polymerization of chloroprene at different temperatures in the presence of a molecular weight regulator of the chain-transfer type (mercaptan). The purpose in mind was the preparation of latex polymers of known, controlled molecular weight for study of film properties.

By the use of such a mercaptan regulator, it has been found possible to prepare polychloroprene latex at temperatures of 40, 20, 5, and —25° C., having a known

average molecular weight and a molecular weight distribution corresponding to a probability curve.

The compounding of these latices for study of film properties has shown that the tensile strength of the rubber rises sharply with decreasing polymerization temperature, apparently due, in large part, to greater crystallinity. No effect of polymer molecular weight on ultimate strength was observed, within the range of molecular weights studied. However the expected inverse relation between molecular weight and rate of attainment of optimum cure was observed.

The presence of microgel not only retarded the attainment of optimum cure, but also resulted in lower elongation values.

9:55 a.m.—20. Practical Rubber Vulcanization through Peroxide Cross-Linking. L. O. Amberg and W. D. Willis, Hercules Powder Co., Wilmington.

Peroxide vulcanization of rubber has been known since 1915. The process was never practical because of the poor properties of the resulting product.

Recntly a potentially practical process was developed which produced satisfactory products by using peroxides like dicumyl peroxide. Comparative data on sulfur and dicumyl peroxide as curing agents indicate widespread applications ranging from specialties requiring light colors to large-volume items like automobile tires.

Aging resistance of these peroxide-cured rubbers is outstanding in comparison with sulfur-cured products. Unlike sulfur, dicumyl peroxide by its use does not discolor or increase the opacity of the product. Furthermore neither the color nor the opacity is increased on exposure to light. These properties suggest the use of peroxide-cured rubber for white sidewalls of tires, drug sundries, and surgical goods.

Accelerators to speed up or modify the cure rate have not yet been developed. The cure rate of simple dicumyl peroxide-rubber compounds, however, falls within the range of common sulfur-rubber vulcanizates.

10:20 a.m.—21. Peroxide Cures of Nitrile Rubber. C. H. Lufter, B. F. Goodrich Chemical Co., Cleveland.

There are many references in published literature to the vulcanization of natural rubber with peroxidic chemicals. Peroxide vulcanization of diene polymers has been considered due to free radical mechanism. The products resulting from the interaction of rubber and peroxides, however, have often been reported to be inferior to sulfur-accelerator vulcanizates.

By the use of some of the newer peroxidic chemicals now available, however, nitrile rubber has been cross-linked to produce vulcanizates with interesting and useful properties. The tensile strength obtained from the peroxide cure is generally slightly lower than that from a good sulfur cure, as is the elongation. Compression set may be made to match the set resulting from a sulfur cure; while aging of the peroxide cured vulcanizate may be superior to that from most sulfur cures. The excellent oil resistance of the nitrile vulcanizates is not impaired by the peroxide cure. A particularly important feature may be the unusually good low-temperature brittleness which some of the peroxide cures exhibit.

Immediate application of peroxide cures appears to be in the fields where a low temperature cure or a completely sulfurless stock is required. The use of the unique low-temperature brittleness noted in some of the high acrylonitrile formulations may find application in fields requiring good low-temperature properties combined with the best oil resistance.

10:40 a.m.—22. Petroleum Waxes for Protecting Rubber Compounds from Cracking and the Relative Merits of Ozone-Exposure Testing and Natural Aging of Rubber. Paul D. Sharpe, Socony-Vacuum Laboratories, Brooklyn, N. Y.

The effect of ozone on rubber is well known and is thoroughly covered in the literature. Protective surface coatings are generally utilized to minimize the effects of ozone and prolong the useful life of rubber articles. At present, hydrocarbon waxes, if added to rubber in excess of their solubility, are among the more economical and effective materials for the purpose.

Attempts have been made to use accelerated ozone-cracking tests in the laboratory as a guide to service performance of rubber. These accelerated methods, although useful, give variable results in testing of rubber in which waxes are used.

This study was made to show the erroneous conclusions which may be drawn from an accelerated ozone test as compared with an outdoor-exposure test when waxes are used as protective agents for rubber.

Data on ozone exposure are provided which do not correlate with those from a natural aging test. Several waxes which rated well in the accelerated test fared poorly outdoors.

11:05 a.m.—23. A Study of the Reaction of Ozone with GR-S Rubbers. E. R. Erickson, E. L. Hill, R. A. Berntsen, Augustana Research Foundation, Rock Island, Ill.

The reaction of ozone at low partial pressures with compounded and vulcanized GR-S rubber under stress, containing an antiozidant, or an antiozidant and Heliozone wax, proceeds in two phases. There is an initial phase in which the initial quantity of ozone-sensitive material, chiefly the antiozidant, on the surface of the rubber together with fresh antiozidant continually migrating to the surface is oxidized by ozone at a variable rate. This reaction is a psuedo first-order reaction.

The initial phase is followed by a second phase in which the rate of reaction of ozone with ozone-sensitive materials on the rubber surface becomes constant and is fixed by the rate of migration of the antiozidant through the oxidized film on the rubber surface.

A quantitative measurement of both the rate of absorption of ozone and the quantity of ozone absorbed was made on a standard GR-S rubber rod, under 20%, containing 5.4 parts N,N'-di-sec. butylbenzidene and one part wax and the GR-S rod was subjected to an intermittent exposure to ozone of known concentration for a total of 92.3 hours. No ozone cracks were found on the rubber surface. The value of the specific rate constant was found to be 0.092-hour $^{-1}$.

11:30 a.m.—24. Ozone Cracking of Elastomers. James E. Gaughan, Detroit Arsenal.

The deterioration of almost all types of rubber automotive items in long-term storage has reached the serious proportions which not even the long-visioned researchers at Rock Island Arsenal might have conceived when they first began research on this subject in the period just after World War II. They correctly ascribed "weather cracking" as being due to ozone attack and found most of this ozone to be generated at high altitudes, after a review of prior work.

New work was done on the deterioration of synthetic rubbers by ozone and the effect of many of the variables involved. About this time many reports of unsatisfactory weather cracking of tires, wire, and mechanical rubber items used on Ordnance vehicles were beginning to filter in. Much confusion existed as to the cause, seriousness, and cure for this situation.

As stop-gap aid, many expensive packaging and spray coating programs were initiated and revised from time to time, but none were completely satisfactory. Likewise steps were taken to insure that some of the critical items be made of the ozone resistant polymers such as neoprene; other items were protected to the extent possible by use of best current knowledge on ozone resistance and specification testing thereof.

A tremendous gap still existed on such items as truck tires. By this time the fundamental research on ozone protection of rubber had progressed to the point where chemical inhibitors against ozone were showing promise, but still were not commercially feasible. In cooperation with Detroit Arsenal, contracts were let to industry to evaluate further this approach. Commercial antioxidants claiming ozone resistance, proprietary developments of certain tire companies, and these new experimental chemical antiozidants were fully evaluated in laboratory tests, outdoor exposure, and fleet tests of experimental end-items in a number of climatic conditions. Results of these tests to date indicate a new high order of ozone protection is possible in GR-S polymers and perhaps also in natural, nitrile, and other unsaturated polymers.

A typical chemical of this class is N,N'-dioctyl-p-phenylene diamine. Accordingly, Ordnance specifications are being speedily revised to require ozone resistance, and it is indeed fortunate that some such solution is forthcoming in view of the ever-increasing reports of the immense dollar waste and loss of valuable defense equipment from this cause.

Friday Afternoon—May 6

John W. Snyder, Presiding

2:00 p.m.—25. Degradation of Oil-Extended Polymers in Presence of Metal Salts. J. M. Mitchell, W. Embree, B. MacFarlane, Polymer Corp., Ltd., Sarnia, Ont., Canada.

The effect of heavy metals, such as copper, manganese, and iron, in catalyzing

the breakdown of natural rubber is well known. Similar effects have been observed with synthetic polymers of the butadiene styrene type, but are generally less marked.

It has been possible to employ iron complexed with various compounds, as activator in a variety of polymerization recipes without harmful effects. It has been found, however, that oil-extended polymers are far more prone to breakdown during drying in the presence of traces of heavy metals. In fact, the amount of iron normally used in many polymerization recipes has been found to exert appreciable catalytic effect. A systematic study has been made in the pilot plant of the effect of different metals in varying amounts and of the behavior of different types of antioxidants.

Deterioration of oil-extended polymers during drying and storage has been found to be negligible when the polymerization recipe is a very low iron content type activated by sodium sulfoxylate.

2:25 p.m.—26. Oil-Extended Alfin Polybutadienes.[3] Avery A. Morton, James R. Critser, and Emanuel Schoenberg, Massachusetts Institute of Technology, Cambridge, Mass., and Bram B. Boonstra, Godfrey L. Cabot, Inc., Boston, Mass.

Alfin polymerization of butadiene gives polymers which have extremely high molecular weights. They are very tough and extremely difficult to handle on the mill. The addition of oil makes the rubber more tractable provided the rubber has been made properly and the oil introduced correctly. A series of tests in which the oil content was varied from 75 to 185 PHR indicated that an optimum point might be about 117-137 PHR. At this level some of the tensiles have ranged from 2400 to 2850 psi., and elongations from 410 to 630%. The corresponding tear resistances have been from 300 to 400, lbs./in. Mooney values have varied from 77 to 83.

The formula employed is

Alfin polybutadiene-oil (Dutrex 20)	100
Vulcan 3	50
ZnO	3
Zn stearate	1.0
Stearic acid	1.0
Santocure	0.75
AgeRite Hiper	1.0
Sulfur	1.75

The cure temperature was 250° F.

Optimum conditions for preparation and use of this polymer have not yet been determined. In these tests the condition for polymerization and introduction of oil has been held constant after preliminary work had shown a generally satisfactory product. The main variable has been the content of oil, with some attention to variation of the Alfin catalyst itself. Some very unsatisfactory results were obtained with one of the catalysts, but the data are not extensive enough to pin the very poor results (as low as 1,000 psi. tensile and 280% elongation) upon that factor. The low-cure temperature is made possible by the tendency of Alfin polybutadiene to cure rapidly. The formula can be adjusted to cures at 292° F.

[3] This work was performed as a part of the research project sponsored by the Reconstruction Finance Corp. Office of Synthetic Rubber, in connection with the Government Synthetic Rubber Program.

[4] Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.

[5] The work discussed herein was performed as a part of the research project sponsored by the Federal Facilities Corp. Office of Synthetic Rubber, in connection with the Government Synthetic Rubber Program.

[6] *J. Am. Chem. Soc.*, 48, 2045 (1926).

John W. Snyder

2:50 p.m.—27. Non-Staining, Oil-Extended Rubbers. R. L. Provost, E. L. Borg, J. L. Paige, W. W. White, L. H. Howland, U. S. Rubber, Naugatuck Chemical Division, Naugatuck, Conn.

Currently approximately 25% of the total GR-S synthetic rubber is produced in the form of oil masterbatch. A small amount of oil-extended GR-S has been manufactured employing a relatively naphthenic oil and a non-discoloring, non-staining stabilizer. Since the naphthenic oil causes a significant degree of staining and discoloration, this type of product has found application only in those end-uses where a slight color change during normal aging is not objectionable.

It was the purpose of this investigation to determine which component(s) of extender oils is responsible for the development of stain in white or light-colored vulcanizates upon exposure to light and to establish characteristics of oils which are satisfactory for preparing non-staining oil-extended rubber.

It was tentatively concluded that above a threshold value of 30-40%, aromatic components in the oils cause staining. Tests indicate that solvent-refined lubricating oils having aromatic contents lower than this threshold value would be satisfactory for the majority of applications. Tread-type vulcanizate tensile strength and abrasion resistance of Polygard[4] stabilized masterbatches prepared with these oils are approximately equivalent to those of naphthenic oil-extended rubber vulcanizates.

3:10 p.m.—28. Equation Governing Stability of Oil Masterbatches.[5] W. K. Taft, A. D. Snyder, J. Duke, H. R. Mooney, Government Laboratories, University of Akron.

A general exponential equation, $V—A = Be^{-at}$, where V equals the corrected dilute solution viscosity of the polymer, t equals time in days, and A, B, and a are constants varying with the characteristics of the oil, has been found to express the breakdown of the polymer in differen oil masterbatches that were heat-aged at 140° F.

This equation is valid until the breakdown reaction has been essentially completed, at which time other factors determine the course of the reaction. These factors vary with the type of oil used. When the constants in the equation for a particular oil have been established, the amount and the rate of breakdown can be calculated.

3:35 p.m.—29. The Determination of Free Sulfur in Rubber Compounds Using Triphenyl Phosphine. M. J. Brock and T. W. Osborne, Firestone Tire & Rubber Co., Akron.

The reaction of sulfur with triphenyl phosphine has been used by Bartlett to study reaction mechanisms in which elemental sulfur is involved.

The use of triphenyl phosphine as a reagent for measuring the elemental sulfur content of rubber compounds has now been investigated. In this determination the finely divided rubber is simmered in an acetone solution of triphenyl phosphine. The excess reagent is then titrated with standard iodine solution, using the "dead stop" endpoint of Foulk and Bawden.[6] A reaction time of one-half hour is usually sufficient; and the extracted rubber need not be removed before titration.

The method has been applied successfully to the determination of free sulfur in natural rubber, GR-S, nitrile (Butaprene NXM), and Butyl rubber compounds. The interference offered by other compounding ingredients has been studied and has been found to be negligible in vulcanized stocks. Although triphenyl phosphine reacts with some sulfur bearing accelerators, it is no worse in this respect than sodium sulfite which is used in the current ASTM procedure. The error introduced by accelerator reaction is usually small, owing to the small amounts of accelerator used and the fact that in vulcanized stocks reactive accelerator sulfur has usually been consumed.

The method is useful for obtaining information concerning the rate and the state of cure and in determining the optimum accelerator-sulfur ratio necessary to obtain the desired physical properties. The utility of the triphenyl phosphine free sulfur data in calculating the combined sulfur content of rubber vulcanizates is discussed.

Owing to its simplicity, rapidity, and accuracy the method is ideally suited for routine control work. Data given show the comparison between the results obtained by the triphenyl phosphine method and the current ASTM procedure.

●

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., will increase by about 25% production of Ti-Pure titanium dioxide pigments at its Edge Moor, Del., plant; the construction project will be completed by late 1956.

Second International Rubber Quality and Packing Conference, May 3-6

The Second International Rubber Quality and Packing Conference will be held at the Essex House, New York, N. Y., May 3-6. The Conference is being arranged for by The Rubber Manufacturers Association, Inc., and the Rubber Trade Association of New York, and natural rubber producers and shippers from Southeast Asia and consumer groups from Europe, Canada, and Japan will be represented. The purpose of the Conference is to provide an opportunity for free and open discussions leading to better understanding of major quality problems for all concerned. The last Conference was held in Singapore, April 22-24, 1954.[1]

Conference Agenda

The provisional agenda for the New York Conference indicates that the first order of business will be a review of existing standard-type samples, both RMA and Singapore. Included also will be a discussion of methods of preparing and distributing type samples to trade and industry, supplying the rubber for preparing RMA-type samples and the duplication of RMA-type samples by organizations outside the United States. The delivery of rubber conforming to type samples will be reviewed with an analysis of 1954 imports into the United States and presentation of the experience of other consuming countries in this connection.

Rubber quality will be discussed with special reference to the raw materials used in preparation of the various types of rubber, methods of preparation for the different types, moisture content, copper and manganese contamination, uniformity, and factory problems with faulty rubber.

Packing specifications (RMA) will be reviewed, and such subjects as bale size and weight, pressure during bale packing, powder specifications, new packing methods, and bale marking paints will be covered.

Sampling and inspection in the United States and other countries will be another major subject for discussion.

Claims and arbitrations will be reviewed with special reference to settlement of claims and the arbitration procedures of the RTA, the RMA, and the General Services Administration.

Under shipping, the subjects to be covered will include loading, storage, and discharging; misshapen bales; water damage and other contamination; shipping marks; dunnage materials; and handling of discharged rubber on piers, in transport, and at consuming factories.

The storage of the different types of rubber and the prevention of deterioration will be followed by a discussion of contracts including the RTA import contract and the RMA factory contract.

Delegates

Organizations from abroad expected to be represented and their delegates according to country are as follows:

MALAYA	
Federation of Rubber Trade Associations of Federation of Malaya, Penang	Heah Joo Seang, president Lim Chong Chee
Malayan Rubber Export Registration Board, Singapore	C. F. Smith, chairman
Rubber Research Institute of Malaya, Kuala Lumpur	Tan Puay Hee, chairman; one other E. G. Holiday, chairman
Singapore Chamber of Commerce Rubber Association, Singapore	Richard Cox, vice chairman A. M. Pearson, secretary
INDONESIA	
Indonesian Chamber of Commerce & Industry, Djakarta	Sutan Sjahsam, Sutan Sjahsam Corp. A. Th. Manusama, Gov't Agricultural Enterprise Representative of AVROS Representative of N. V. Karet Rakjat C. H. Smits, Dunlop & Kolff Mr. Titheruw, N. V. Djawa Maluku Leim Khing Gie, Central Trading Co.
Perserikatan Pengusaha, Penggiling Para, Palembang	Lim T. Jonghiam, chairman Kwee Thiamkiet, Kiangwan Remilling Co.
Oveip, Djakarta	Mr. Boas, Guntzel Schumaker
THAILAND	
Rubber Trade Association of Thailand, Bangkok	Lee In Tong, Thai Paktai Co. Ltd.
VIET NAM	
Indochinese Rubber Planters Association, Saigon	Arthur Nolan
CEYLON	
Colombo Rubber Traders Association, Colombo	None. Have nominated N. Y. agents
UNITED KINGDOM	
Rubber Trade Association of London, London	Maurice Symington
Tyre Manufacturers Conference	L. J. W. Bailey, chairman, Joint Materials Supply Committee
British Rubber Manufacturers Association	Stuart Covell, director, Federation of British RMA Arthur Ahlborn, supplies manager, Avon India Rubber Co.
International Rubber Research Board and International Rubber Development Committee, London	To be represented by one of two men from the RRI, Malaya
NETHERLANDS	
Nederlandsche Vereiniging voor den Rubberhandel, Amsterdam	J. G. Loeber, president
FRANCE	
Syndicat National des Industries du Caoutchouc, Paris	Mr. Oberli, Ste Michelin
Syndicat National des Industries du Caoutchouc—Section Importateur, Paris	Maurice Alcan
GERMANY	
Wirtschaftsverbandes der Deutschen Kautschukindustrie e.V (W.d.K.), Frankfurt	None. L. J. Bailey will represent
JAPAN	
The Japan Rubber Manufacturers Association, Tokyo	Kazuo Oyama, executive director, The Yokahama Rubber Co., Ltd. Kan-ichiro Ishibashi, vice president, Bridgestone Tire Co., Ltd. Seizo Katsumata, counselor, Bridgestone Tire Takehoko Kodama, managing director, Otsu Rubber Co., Ltd. Tadashi Arai, manager, efficiency department, Yokohama Rubber
The Rubber Trade Association (Japan), Tokyo	Toshimasa Ikeda
Kobe Rubber Exchange, Kobe	Eikichi Itoh
CANADA	
Rubber Association of Canada	Will be represented

[1] See our June, 1954, issue, p. 378.

Rubber Division, C.I.C., Meeting May 20

The annual conference of the Rubber Division of the Chemical Institute of Canada will be held at the Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, on May 20. A program of seven technical papers, the titles, authors, and abstracts of which are given below, will be presented. No other details of this meeting, which usually includes a banquet and after-dinner speaker, are available at this writing.

The chairman of the Rubber Division, C.I.C., is F. R. Gorrie, Cabot Carbon of Canada, Ltd. American rubber technologists and others interested in the program are invited to attend this meeting.

Program and Abstracts of Papers

Friday—May 20

1. The Identification of Elastomers by Infrared Spectroscopy. W. H. T. Davison, Dunlop Research Center, Birmingham, England.

The large number of synthetic elastomers and related polymers which are liable to be encountered in the rubber industry raises the serious problem of their identification, for which infrared absorption spectroscopy is the most generally applicable technique available.

The theoretical basis of infrared spectroscopy is outlined with particular reference to polymers. Spectra of mixtures are additive; this condition is the basis of identification of mixtures and of their estimation. In general, copolymers have the same spectra as mixtures of their respective homopolymers.

Experimental techniques are described for preparing samples for spectroscopic examination from both uncured and cured materials. The latter, particularly when reinforced with carbon black, often give difficulty since they transmit insufficient energy for direct examination. A reflecting microscope increases the amount of energy available and permits measurement of the spectra of black-loaded elastomers.

Infrared absorption spectra of a number of homopolymers, copolymers, and mixtures are reported for a frequency range of 650 to 3600 cm. The polymers include polydienes, polyvinyl, and polyiso-propenyl compounds, polyesters, polyurethanes, and silicones. A summary of absorptions characteristic of particular polymer structures is given.

The limitations of the technique are discussed and probable future developments.

2. Nitrile Rubber in Polyvinyl Chloride Conveyor Belts. D. Hay, H. A. Pfisterer, E. B. Storey, Polymer Corp., Ltd., Sarnia, Ont., Canada.

Since the Creswell colliery disaster in the United Kingdom, the demand for fire-resistant conveyor belting for coal mines has been increasing, especially in Europe. One solution to the problem has been the use of polyvinyl chloride as the elastomer because it is readily available in Europe. Unvulcanized nitrile rubber has been used as a non-migratory plasticizer for these PVC belt stocks because it increases tack and permits lower calendering temperatures.

The next step in this development is the vulcanization of the butadiene nitrile copolymer component of the nitrile rubber—PVC stock. This paper shows that the vulcanization of the nitrile rubber component improves physical properties and processing of the stock without sacrificing fire resistance and heat aging properties.

In addition, experimental construction of small belt sections is also described.

3. Growth and Agglomeration of Particles in Low-Temperature GR-S Latex. R. W. Brown and L. H. Howland, United States Rubber Co., Naugatuck Chemical Division, Naugatuck, Conn.

A new method for the agglomeration of GR-S latex is described. Medium particle size latices have been agglomerated sufficiently to allow concentration to 60% solids at low viscosities.

Studies of high solids latices during polymerization showed extensive agglomeration taking place at intermediate conversions. At early conversions some high solids latices contain as many particles per unit weight of polymer as low solids latices. In these recipes the most critical factor governing agglomeration was found to be the ratio of monomer to water phase. With more than about 70 parts of water per 100 of monomers the amount of agglomeration taking place was not sufficient to give high solids latex in the proper viscosity range.

Electron photomicrographs show that in some recipes new polymer particles are initiated by soap released during agglomeration. Several peculiarities of polymerization rate and particle size distribution of high solids latex were explained by this study.

4. Elastomeric Foams. T. H. Rogers, Goodyear Tire & Rubber Co., Akron, O.

Elastomeric foams presently available may be divided into three main classifications: rubber latex foam, vinyl foam, and polyurethane foam.

The rubber latex foam may be produced with from 100% natural rubber latex, 100% synthetic rubber latex, or from varying quantities of natural and synthetic latices.

Vinyl foam varies in physical properties, depending on type and quantity of plasticizers used. Flame-resistant compositions having good flexing properties are possible.

Polyurethane foams may be made over a wide range of compressions with relatively small changes in densities. Such foams exhibit good life, have excellent flame resistance, and are exceedingly light in weight. Their resistance to aging, using the accelerated tests commonly used for latex foam, is outstandingly good.

Charts and graphs have been drawn up showing the physical properties of these various elastomeric foams. The chemistry and general methods involved in making the foams are discussed.

5. Rubber and Related Material Applications in Wire and Cable Manufacture. George G. Winspear, R. T. Vanderbilt Co., Inc., New York, N. Y.

This paper presents a brief but fairly comprehensive outline of the vulcanizable elastomers used, compounding problems, and processing techniques which are typical in the wire and cable branch of the rubber industry.

Statistics are given to show trends in polymer consumption and the extent to which plastics are entering into fields formerly dominated by vulcanizable rubbers. While based on U. S. manufacture, these statistics serve as a guide to Canadian practices which closely parallel those followed by American manufacturers.

Compounding problems, touching on the more difficult processing and specification requirements, are discussed, and several typical formulae listed with explanations pertaining to the use of specific materials.

The Room Temperature Feed Process, latest development of Western Electric Co. where the C. V. process originated, is described and illustrated by way of outlining the problems of high-speed extrusions and continuous vulcanization to those not directly connected with wire and cable manufacture.

6. Industrial Research and Development Techniques. B. M. G. Zwicker, B. F. Goodrich Chemical Co., Cleveland, O.

Industrial research and development has become an essential cost of competitive business enterprise. It has become an organized endeavor with its own special problems, and new techniques are evolving to improve its productivity and efficiency of operation. This paper describes some of these problems and techniques.

The stability of our present economy and the continued growth of our material standard of living are based on change. Industrial research and development has the task of guiding this change so that it will provide products of better value for less money rather than just gimmicks for quick promotion.

Intelligent market research, planned product development, and honest sales development and promotion are indicated for new and better consumer products. This job is a cooperative one for the manufacturer and the raw material supplier. It takes time to find and develop a new rubber or plastic raw material. Therefore long-range planning is needed to guide the supplier's research and development programs. The product manufacturer can assist by (1) designing his present products around present materials and (2) telling the raw material supplier what he believes he needs for better value design in the years to come.

Prices for present products should provide enough money for the necessary research and development by both supplier and product manufacturer. The research and development programs should be planned to provide frequent checks on progress toward the ultimate goal. Premature commercialization must be avoided to prevent errors that would destroy the consumer's growing confidence that the newer products coming from reputable manufacturers are always better value.

7. Polyurethane Products. H. H. Abernathy, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Reaction of multifunctional isocyanates with hydroxy terminated resins results in a series of products ranging from hard, tough plastics to elastomers. The products may be made in cellular form if desired. The chemistry involved in the preparation of these products is discussed.

The physical properties of a metal-to-metal adhesive; a new urethane rubber, "Adiprene" B; and both semi-rigid and elastic foams are outlined. Emphasis is given to the abrasion resistance of "Adiprene" B, as illustrated by fleet tire tests, and to the compression-deflection characteristics of a freeze-resistant polyurethane elastic foam.

Chicago Group Hears Stevenson on Isocyanate

A. C. Stevenson, elastomers division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., presented a paper on "Isocyanates and Polyurethanes" before the February 18 meeting of the Chicago Rubber Group.[1] He traced the origin of these materials and described their current and eventual applications in the fields of adhesives, foam products, fluid elastomers, and urethane rubbers.

Mr. Stevenson attributed the unique characteristics of isocyanates to their inherent reactivity with compounds containing active hydrogen; to their polyfunctionality, which can be utilized in making polymeric materials; to their flexibility, through control of reactivity of the isocyanate function by substitution in the aromatic nucleus; and to their suitability for application as cross-linking agents in polymer systems.

Especially valuable for their load-bearing capacities, compared with natural rubber GR-S foams, are the resilient polyurethane foams, he said. A two-pound polyurethane foam has about 50% more load-bearing capacity than a six-pound natural rubber/GR-S foam. These foams have high tensile strengths, excellent abrasion resistance, tear resistance, good aging properties.

Mr. Stevenson discussed the potential of fluid polyurethane polymers. These are based on relatively low molecular weight isocyanate-terminated polyurethanes, and indications point strongly to their finding ready application in terms of their good flexibility.

Urethane rubbers, of which du Pont's Adiprene B is an example, were described in detail. Adiprene B has a particularly low brittle point, and an evaluation of it in tire tread compositions has shown that it doubles the service of a conventional GR-S tread. Du Pont has improved the processability of the rubber by the use of such plasticizers as fluid butadiene acrylonitrile copolymer and by the employment of less reactive diisocyanate curing agents. Stocks can now be extruded several days after mixing, and these extrusions can be cured a few days later. Possessing qualities of good abrasion, high tensile strength, and solvent resistance, "Adiprene" B should also find application in oil field supplies, mechanical goods, footwear, and cut thread, Mr. Stevenson concluded.

[1] See RUBBER WORLD, Mar., 1955, p. 765.

Washington Group News

The Washington Rubber Group, meeting March 16 at the Pepco Auditorium, Washington, D. C., heard a discussion of "New Trends in Polyethylene" by John R. Brown, Jr., Spencer Chemical Co. The properties and applications of polyethylene, a material expected to surpass vinyls and phenolics in volume produced, were described.

A month previously, on February 16, Walter Klippert, vice president of Goodyear Rubber Plantations Co., had addressed the group on "Goodyear in Brazil," relating how Brazil, the birthplace of natural rubber production, is now enjoying a resurgence of the industry after seeing its virtual extinction there in the 1930's. Goodyear recently purchased an 11,000-acre tract for rubber growing in that country.

Klippert indicated that he felt both natural and synthetic rubbers must be made available in substantially greater supply to keep up with the rapidly expanding world demand. Although the United States is the greatest consumer of rubber and increases its requirements about 4% per year, the rest of the world is increasing its requirements at the rate of 8-9% per year, it was said.

An amendment to its constitution to merge the functions of the recording secretary and secretary for reasons of efficiency has been voted upon.

Accelerators Reviewed

The Buffalo Rubber Group, meeting March 8 at the Hotel Westbrook, Buffalo, N. Y., heard M. E. Baker, Monsanto Chemical Co., discuss "The Function of Accelerators in Rubber Compounding." Seventy-five members and guests were present.

Mr. Baker reviewed the functions of the three main classes of accelerators: the guanidines; the aldehyde-amines; and the carbon disulfide types, including the thiurams, the thiazoles, and the carbamates. The importance of selecting the proper accelerator to obtain the desired physical property was stressed.

Fowler Discusses Latex

"Industrial Applications of Latex" was the subject of a talk given by Don Fowler, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., before a joint meeting of the Ontario Rubber Section and the Wellington-Waterloo Section, C.I.C., at the Royal Hotel, Guelph, Ont., Canada, March 8. Present were 110 members and guests.

Mr. Fowler covered the types, production, chemical and physical properties, and industrial applications of latex. The versatility of the material was shown by a discussion of such latex end-products as foam sponge, rubber thread, wire insulation, backing-treated carpet piles, artificial leather, mastic tape, dipped goods, paint, and latex-covered plaster of Paris molds.

IRE Holds Convention

The Institute of Radio Engineers held its National Convention and Radio Engineering Show, March 21-24, with an exhibition of electronic apparatus and techniques at the Kingsbridge Armory, and technical sessions at the Waldorf-Astoria and Belmont Plaza hotels, New York, N. Y. More than 40,000 attended the events.

New products exhibited of interest to the rubber industry included a synthetic rubber-coated nylon flat braided lacing tape called Gudelace-H, made by Gudebrod Bros. Silk Co., Inc.; fungus- and water-resistant, the lace is easy to handle and adheres to covered wire without slipping.

Isomode Pads, new striated neoprene machine mountings that control vibration and noise of machines in operation and absorb the impact of such downward accelerating machines as the punch press, were also shown. A product of MB Mfg. Co., Inc., the Pads need no special bolting to the floor, are resistant to oil and water, and the 18 by 18 by 5/16-inch pad can support 1½-8½ tons of machine.

Among the papers presented during the technical sessions were those covering such pertinent subjects as instrumentation, instrumentation and nuclear science, industrial electronics, automatic control, production techniques with electronic equipment, nuclear science, and electronic computers.

Cleveland's Atom Exhibit Slated for December 10-17

What is said to be the world's first major Atomic Exposition will be held in the Cleveland Public Auditorium, Cleveland, O., December 10-17, under the sponsorship of the American Institute of Chemical Engineers. The event will be conducted in conjunction with a Nuclear Congress cosponsored by 16 management, engineering, and scientific societies.

According to Athel F. Denham, exposition director, and J. V. Friel, exposition manager, exhibitors will fall into three major classes. They are suppliers of materials, parts, equipment, and services to the atomic power and allied fields; companies directly identified with the nuclear power field; and companies in the non-power atomic fields, such as manufacturers of equipment and materials for application of radioactive isotopes in industry, medicine, and agriculture.

Exhibits will be outside of the classified category, with military applications excluded. A sampling of exhibits includes air conditioning equipment, chemicals and chemical processing equipment, protective clothing, electronic devices and instruments, insulation, isotopes, materials handling devices and remote operation equipment, mining and geological equipment, models of reactors and component materials, waste disposal equipment, tracers, and radiographic equipment.

The general public will be admitted only during non-business hours.

Companies can obtain information and establish priority for space by writing the Atomic Exposition, 931 Book Bldg., Detroit 26, Mich.

NEWS of the MONTH

Washington Report Summary

Congress rejected on March 23 all the objections to the recommendations of the Rubber Producing Facilities Disposal Commission for the transfer of 24 of the government synthetic rubber plants to private industry, and purchasers of these plants will take title between April 21 and 29. The plants are capable of producing at least 689,000 long tons of GR-S and 90,000 long tons of Butyl rubber a year. Oil extension of GR-S can add 60,000 to 70,000 additional tons to this total. Neoprene and other privately produced synthetic rubbers will add 112,000 more tons a year to U. S. capacity.

Commerce Department and rubber industry economists estimate U. S. demand by 1959 for synthetic rubbers to be 1,010,000 long tons so that expansion of the present 891,000 tons' annual capacity (less oil extension) in the near future seems indicated. Plans for such expansion were revealed by the several purchasers of the plants.

Copolymer plant operators testified that they were committed to make available a minimum of 152,520 long tons of GR-S annually to small business firms. Nevertheless the Senate Banking subcommittee asked the Justice Department to report to Congress each year for the next 10 years on "competition or lack of competition, existing in the synthetic rubber industry during the year of the report."

The base price for both regular synthetic rubber of the GR-S type and for Butyl rubber will be 23¢ a pound, f.o.b. plants in most cases. GR-S type rubber producers have booked some orders and are actively competing for customers. Butyl production during 1955 will be approximately 55,000 long tons.

Three government plants remain unsold. Special legislation permitted new bidding for the Baytown, Tex., GR-S copolymer plant. The alcohol-butadiene at Louisville, Ky., was leased for three years to Publicker Industries, Inc. The GR-S copolymer plant at Institute, W. Va., appears likely to continue indefinitely in standby.

Washington Report

By ARTHUR J. KRAFT

Free, Competitive Synthetic Rubber Industry Begins April 30

Ever since V-J Day, disposal of the war-built government-owned synthetic rubber industry has been debated intermittently in Congress and elsewhere. Nearly half of the 51 plants which went up under the wartime emergency program were peeled off when the war ended and sold at about 35¢ on the dollar. Aside from a neoprene plant and four styrene plants, most of those thus disposed of were of little or no further use to the rubber program; by and large, they were small plants.

Congress went about welding the others into an integrated, sturdy industrial enterprise, nursing it along for seven years with the aid of artificial props in the form of mandatory consumption (force-feeding synthetics) and product specification controls. Two years ago, after Korea showed that the infant giant had at last come of age, Congress offered the plants for sale—29 facilities in all, most of them of considerable size.

A Government Disposal Commission, operating under Congressional instructions, negotiated contracts of sale. Fourteen private firms—mainly giants in the tire, oil, and chemicals industries—were the lucky winners in this "slow auction." They laid out $310 million for 24 of the major government plants, plus inventories and equipment. The $260 million for the plants alone amounted to a return of 62¢ on each dollar which went into their original construction.

Last month the sale was sealed. After two days of frenzied debate, Congress voted the government out of the rubber business and invited private industry in. The vote, disapproving resolutions to upset the entire slate of contracts, was 56-31 in the Senate and 283-132 in the House, with virtually all the opposition to the sale coming from Democrats. The new owners will take formal title to their new properties between April 21 and 29, along with some 50,000 tons or more of rubber, now in government inventory, which will be split up among the copolymer plant purchasers. Except for what it will produce at Baytown, Tex. (General Tire operation) the government will make its last delivery of synthetic rubber April 29.

What Industry Bought

What are the new proprietors getting for their money? To begin with, they'll have a guaranteed market among some 800 rubber firms who had been on the government's customer list. At the moment, demand for all types of rubber is booming. The government, operating its synthetic plants at capacity the past few months, has been forced to draw heavily on inventories (and even to turn down some extra-heavy orders) to keep pace. The long-term outlook is equally reassuring; there'll be some ups-and-downs to be sure, but the trend is all upward. Today's synthetic plants will have to be augmented through expansion or additional facilities within a few years.

The new proprietors this month will be walking into facilities which, while a dozen years old, have been kept in pretty good shape. They're not outmoded yet, and many improvements and replacements have been

Reni Photos

Holman D. Pettibone, Chairman, Rubber Producing Facilities Disposal Commission, testifying before Senate Banking & Currency committee

made in the past few years—a great many in the past few months. Generally, the 24 facilities in the disposal package have a long useful life ahead—10 years, give or take a year or two. Together, they are equipped to produce 779,000 tons a year of rubber—689,000 of GR-S and 90,000 of Butyl.

You can add to this some 57,000 tons already obtainable from GR-S plants through the mixing in of cheap oils to extend output and lower costs. The end is not in sight yet for oil extension, and this will probably be the first avenue of resort for further increasing output in the immediate months ahead. Plans disclosed to Congressional committees last month also point to a more diversified range of types from most of the plants and expansion of cold latex capacity.

Together, these spell a solid expectation of profitable operation, certainly for the present. Independent industrial engineers retained by the Disposal Commission figured a 12% profit before federal income taxes (5.7% after taxes) for copolymer plants under private operation and a 26.3% profit before taxes (12.6% after taxes) for butadiene plants. In each case the figures were based on an assumed production at 80% of capacity and selling prices of 23¢ a pound, f.o.b. producing plant, for GR-S and 14¢ for butadiene.

Feedstock costs for butadiene plants were estimated at 13-15¢ a gallon for butylenes and isobutylene and 5.5-6¢ for butane at Borger; butadiene for copolymer plants at 14-15¢ a pound and styrene at 17-18¢; for the styrene plant, benzene was priced at 43¢ a gallon, and propane at 4.3¢. Conversion costs were assumed to be those under recent government operation. Allowance also was made for depreciation (7.5-10% of purchase price—assuming a useful life of 13.33 to 10 years); administrative, selling, and research and development (3.5% of sales for butadiene; 4.5-6% for copolymer; 6-8% for butyl; 5-8% for styrene); insurance at 75¢ per $100; interest on the purchase mortgage at 2% of total purchase price; federal income tax at the maximum 52 and 47% rate. Under government operation, the rubber program in the past three years netted about 15-16¢ profit on each sales dollar (while paying no federal income taxes, no insurance, no advertising, and very little in administrative costs, aside from the management fees to plant operators).

Commerce Consumption Outlook

As might be expected, the hearings on the rubber disposal program brought out much information not directly related to the contracts of sale. Chief among these were special studies on future demand for synthetic rubber as well as a cost analysis indicating the likely profit picture for private operators of the government plants.

The Commerce Department and rubber industry economists came up with this five-year outlook for U. S. rubber consumption: 1955—total, 1,330,000 tons, including 568,000 of natural, 762,000 of synthetics; 1956—1,340,000, including 520,000 natural, 820,000 synthetics; 1957—1,380,000, including 510,000 natural, 870,000 synthetics; 1958—1,420,000, including 480,000 natural, 940,000 synthetic; and 1959—1,460,000, including 450,000 natural, 1,010,000 synthetic. The estimates for 1957 and beyond are based on a 3% annual growth rate—lower than achieved in the past by the rubber industry.

This will mean expansion of present synthetic rubber facilities—now an estimated 891,000 tons, less the 44,000-ton Baytown plant and the 122,000-ton "mothballed" Institute plant. The 891,000 tons—which include 112,000 tons of neoprene and other privately produced rubber—can be augmented by some 60,000 tons of oil, used to extend GR-S.

Commented Commerce's Everett G. Holt: "Because of the high rate of United States consumption of natural latex, the outlook is for a sharper contraction in percentage usage of dry natural rubber than of total natural rubber, *which will necessitate industry adjustments in compounding and rubber formulas.*" [Italics ours—EDITOR.]

The Patman Objections

Testimony presented by the plant purchasers themselves before the Congressional committees reviewing the contracts last month brought forth information on their operating and selling plans. Some of this was presented in the formal statements drafted back at company headquarters in preparation for the hearings; much more was elicited through questioning by the Congressmen. The intentions of the private operators were disclosed before the public in an effort to counteract the heavy artillery deployed against the disposal program by Chairman Wright Patman (Dem., Tex.) and Rep. Sidney R. Yates of the House Small Business committee. With a heavy assist from Chairman Emanuel Celler (Dem., N. Y.) of the House Judiciary committee, they attempted to convince the Congress that the contracts should be rejected on these grounds:

Nearly all of the purchasers are large firms, with long records as defendants in federal anti-trust proceedings. Almost all have been convicted or entered nolo contendere pleas in lawsuits brought since V-J Day. Congress, it was contended, should not "reward" these firms by handing them valuable properties lock, stock, and barrel. Far worse, in their view, would be the "inevitable" consequence of sale to this group. The consequences, as they pictured it, would be a combination of all the evils of monopoly foisted on the synthetic rubber industry—restricted production, price gouging, and, worst of all, the denial of essential rubber to the 800 or more smaller rubber fabricating firms who would become dependent on their monopoly-bent competitors. Thus the monopoly would grow, feeding on small firms to the point where only a handful of giants would remain in the field.

These same legislators also attempted to create doubts in the minds of their colleagues as to the adequacy of the protections provided under the disposal law for small business. Each of the copolymer (and Butyl) plant purchasers had agreed in his contract with the Commission to make available to small, non-integrated business firms a specified portion of his production at reasonable terms. These "set-asides" were expressed in terms of percentages and, in some cases, in terms of tons. The "warranties" setting them forth varied from company to company.

Yearly Competition Check?

Stanley N. Barnes, the Justice Department's anti-trust chief, said he would have preferred to see "stronger language" in some of the warranties, but gave as his personal opinion that most, if not all, were enforceable in the courts. Judge Barnes also questioned the presumption that companies will violate the anti-trust laws in the future simply because they did so in the past. He promised the Senators, however, that the Justice Department would keep a careful watch over the practices of the purchasers in the future to make certain that the anti-trust laws are observed. The committee subsequently asked the Department to submit a report to Congress each year for the next 10 years stating, "the Attorney General's findings and opinions with respect to the competition, or lack of competition, existing in the synthetic rubber industry during the year of the report . . . the Attorney General should comment upon the extent to which small businesses are receiving a fair share of the end-products at fair prices, as contemplated by Public Law 205 (the Disposal Act of 1953) and the sales contracts."

Such a report, of course, would require much data collecting and checking, the compilation of sales information from all sellers of GR-S on all their transactions with small business customers. It's the sort of data that the government collected up to a few years ago, for purposes of allocating rubber, and at a considerable expenditure of funds, time, and effort. Our guess here is that there's scarcely a Chinaman's chance that the Budget Bureau would approve the funds necessary to compile the detailed information "requested" of the Justice Department by the Senate Banking committee. Without detailed data, such

findings on competition as the Department might make would necessarily be general in nature and probably of little or no value in pin-pointing such violations as may occur of the contract provisions requiring the plant buyers to supply the need of smaller firms.

Vinson Questionnaire

This fact was recognized instantly by friends of the disposal plan in the House Armed Services committee. Until Mr. Yates launched his attack upon the disposal program, it had looked very much like the contracts would breeze through that committee without serious challenge. Mr. Yates' testimony changed all that. He made such a deep impression on committee members that it became obvious that something must be done to offset the monopoly practices attack.

Committee Chairman Carl Vinson (Dem., Ga.) went about doing it, with a 13-point questionnaire which he popped at each of the copolymer plant buyers a few days afterward. Recognizing the danger to the disposal program, Mr. Vinson demanded that the purchasers answer "fully, fairly, and unequivocally so that the public, the Congress and you may know exactly what your commitments are. Less than complete candor," he warned the plant buyers, "will not serve the public interest"—a gentle way of saying that unless the companies buying the plants gave satisfactory evidence that Mr. Yates' fears about the fate of small business were unfounded, the contracts might be nullified by Congress.

The Disposal Commission also was asked to come back with a rejoinder to the Yates-Patman charges. The testimony elicited by the Armed Services committee in reply to the charges of monopolistic practices included much that had not previously been disclosed.

The copolymer plant purchasers testified that they are committed to make available a minimum of 152,520 long tons annually of GR-S to small business firms, excluding subsidiaries of companies operating GR-S producing plants. Moreover, each of the plant buyers went on record with statements that they considered themselves both morally and legally obligated to furnish all requirements of smaller firms up to this total. All agreed that the contract warranties under which these commitments were undertaken are enforceable in the courts.

Plant Purchasers' Replies

Here's a rundown, company by company, of the testimony on these points:

Goodrich-Gulf Chemicals, Inc., William S. Richardson, director, testifying: The Port Neches copolymer plant will be run at capacity—90,000 tons a year—if the company has customers for that much rubber. In any event, a minimum of 15,000 tons will be made available to small business (excluding The General Tire & Rubber Co., which the witness said is not a small business firm as defined in the Rubber Act)—in equal monthly quantities. Mr. Richardson said that even if Port Neches were run at only 15,000 tons annually, "we would have to legally and morally make it all available to small business."

The B. F. Goodrich Co., of which Mr. Richardson is president, has been dickering with Shell Chemical Co. for the purchase of some GR-S from the Los Angeles copolymer plant to supply Goodrich tire plant needs in that area. "They (Shell) have an awful low price," he said, pointing out that should Goodrich buy from Shell, it would make more rubber available from Neches for sale to the general market.

Goodrich-Gulf will invest $1 million "as soon as we take over" to make Neches copolymer "more flexible so it can produce more types than it now does so that it can service the interests of those who may become our customers." The firm also is "in the middle of engineering studies" leading to a "very substantial increase in production from that plant" in anticipating the increased demand for "GR-S type" of rubber foreseen within the next three to five years.

Goodrich-Gulf will sell GR-S at 23¢ a pound, f.o.b. Neches, at the start. Mr. Richardson's reply to another committee question—seeking to ascertain the effect of either a price increase or decrease for natural rubber on future GR-S prices—is worth quoting in full:

"I don't think that anyone can foretell the price of natural rubber. There seems to be the opportunity for speculative interest to get into that market. I personally think the price of natural rubber is too high at the present time [about 30.5¢ when he spoke]. The cost of producing natural rubber on the more advanced plantations using the budgrafted trees of the better type is in our knowledge 10 to 11¢ a pound. Now that is not the cost of delivering it and making a profit on the investment, but that is the cost of producing it. Obviously, if and when natural rubber is in excess supply, GR-S sold in the competitive

PLANT TRANSFER TIMETABLE

	April 21
Esso Standard Oil Co.	**Butyl rubber plant, Baton Rouge, La.**
Copolymer Corp.	**GR-S copolymer plant, Baton Rouge, La.**
	Petroleum butadiene plant, Baton Rouge, La.
	April 22
Firestone Tire & Rubber Co.	**GR-S copolymer plant, Lake Charles, La.**
Petroleum Chemicals, Inc.	**Petroleum butadiene plant, Lakes Charles, La.**
	April 25
Standard Oil Co. of California	**Petroleum butadiene plant, El Segundo, Calif.**
Shell Chemical Corp.	**GR-S copolymer plant, Los Angeles, Calif.**
	Petroleum butadiene plant, Los Angeles, Calif.
	Styrene plant, Los Angeles, Calif.
Great Southern Chemical Corp.	**Miscellaneous equipment, Corpus Christi, Tex.**
	April 26
United States Rubber Co.	**GR-S copolymer plant, Naugatuck, Conn.**
	DDM chemical plant, Naugatuck, Conn.
Firestone Tire & Rubber Co.	**GR-S copolymer plant, Akron, O.**
Goodyear Tire & Rubber Co.	**GR-S copolymer plant, Akron, O.**
	April 27
American Synthetic Rubber Corp.	**GR-S copolymer plant, Louisville, Ky.**
Phillips Chemical Co.	**GR-S copolymer plant, Borger, Tex.**
	Petroleum butadiene plant, Borger, Tex.
Koppers Co., Inc.	**Alcohol butadiene plant, Kobuta, Pa.**
	April 28
Humble Oil & Refining Co.	**Butyl rubber plant, Baytown, Tex.**
	Petroleum butadiene plant, Baytown, Tex.
Goodyear Synthetic Rubber Corp.	**GR-S copolymer plant, Houston, Tex.**
Food Machinery & Chemical Corp.	**Petroleum butadiene plant, Houston, Tex.**
	April 29
Goodrich-Gulf Chemicals, Inc.	**GR-S copolymer plant, Port Neches, Tex.**
	Petroleum butadiene plant, Port Neches, Tex. (Undivided half interest)
Texas-U. S. Chemical Co.	**GR-S copolymer plant, Port Neches, Tex.**
	Petroleum butadiene plant, Port Neches, Tex. (Undivided half interest)

enterprise system will have to compete against that.

"Now, quite contrary to the policy which was followed by the Federal Facilities Corp., of maintaining the price of 23¢ a pound when the price of natural rubber was dropping last year and got to be three, four, and five cents a pound below the price of GR-S, I feel quite confident that it would be the policy of Goodrich-Gulf Chemicals not to let its plants and its plant capacity lie idle [Goodrich-Gulf also bought a half interest in the Neches butadiene plant], but to tend to move the price of synthetic rubber downward with the price of natural rubber, to the point where we could no longer sustain the competition and still have any return on the investment.

"Now, if natural rubber were to go up —it is up right now. We have stated that it is our policy to sell synthetic rubber from this facility at the same price the government is selling it now. I can't commit into the future. I do not know what our labor costs will be, what they will increase. I do not know what our raw material costs will increase. But I can state that the policy would be not just to follow the price of natural rubber, but to incorporate into our selling prices all our costs that might be existent at any time and still assure ourselves a fair return on the capital employed in that business."

American Synthetic Rubber Co., Thomas Robins, Jr., president: The Louisville copolymer plant bought by this combine of 29 companies (mostly small firms) will be run at capacity—46,000 tons—"if we can get the customers." Between 4,400 and 15,000 tons will be made available for sale to small business firms, excluding any participating in American Synthetic or in the operation of any other copolymer plant, through American Cyanamid Corp., operating as exclusive sales agent for American Synthetic's participants [American Cyanamid has a 30% interest in the Louisville plant]. Some constituents of American Synthetic also are buying GR-S from Phillips Chemical, buyer of the 66,000-ton Borger copolymer plant, to supplement the 25,000 to 30,000 tons that American Synthetic's 28 rubber consuming constituent firms will be taking from their own plant at Louisville.

The venture, Mr. Robins testified, probably will "lose money for the first couple of years. We hope in the third year to get in the black. We are hopeful of making a profit of approximately 10% on our invested capital after we get these loss years behind us."

The witness said that some 40 rubber firms turned down offers to join in financing the purchase of the Louisville plant, many because they felt they could do better without their own captive supply of GR-S. The 29 firms which ultimately pooled their resources raised $5,850,000 among them, of which $2.9 million will go for buying the plant (including $600,000 for improvements made since American Synthetic entered its bid last May). Working capital will take between $1 and $2 million. Another $1 million has been set aside for expansion and additional equipment to diversify the plant—make it a multipurpose plant (six additional reactors will be installed, resulting in a 25% boost in capacity over the 46,000 tons now there. If the reactors are used to make latex, however, capacity of the plant will remain at 46,000). The plant will be equipped, Mr. Robins said, to produce latex, oil-extended rubber, and wire and cable rubber —none of which are now produced there.

The witness predicted that by the time the plants are transferred to their new owners—the end of April—all the problems incident to supplying the 1,200 scattered buyers of rubber with the types and grades they want will be "straightened out to the satisfaction of everyone." As for the future price of GR-S, he made this point:

"As prospective owners of American Synthetic, we are very conscious of the threat to our successful operation, should we for any reason raise our selling price. The rubber industry has to compete with plastics of many types in many of its product lines."

Reni Photos

Laurence E. Robbins, Administrator, Federal Facilities Corp., before Senate Banking & Currency committee; E. Dorrance Kelly, Director, Synthetic Rubber Division, FFC, on right

United States Rubber Co., John P. Coe, vice president: The Naugatuck plant will be run at about the present capacity rate of 22,000 tons, of which 13,000 tons will be made available to small business. U. S. Rubber also has a "tentative" commitment to buy 10,000 tons from Shell at Los Angeles for the balance of 1955 and will be buying some black masterbatch from Phillips at Borger. Prices of 25.5¢ to 26¢, delivered, have been set already for some of the specialty types produced at Naugatuck—the types used for wire insulation.

The price of natural rubber, Mr. Coe testified, "can go up and down quite widely without affecting the price of synthetic. . . . I think the price of synthetic, in reverse, will have the effect of steadying the price of natural rubber, so that the variations in the future will be less sharp."

Copolymer Corp., Harry J. Kahn, general counsel: The seven tire companies making up this firm have purchased a copolymer and a butadiene plant at Baton Rouge, capitalizing the two facilities at $5.1 million. The former can produce 49,000 tons of GR-S, and plans call for operating at that figure. At least 4,900 tons will be made available at "competitive prices" to small business firms, exclusive of Copolymer plant participants or their subsidiaries. Capacity of the copolymer plant will be increased to 52,500 tons through installation of oil-extension equipment.

Firestone Tire & Rubber Co., James E. Trainer, executive vice president: Firestone hopes to run the two copolymer plants it purchased [Lake Charles, 99,600 tons, and Akron, 30,000 tons] at full capacity, making a minimum of 26,000 tons available from both plants to small, non-integrated companies.

Firestone also plans to boost capacity at Lake Charles to 113,000 tons. Offering GR-S from both plants at 23¢ a pound, f.o.b., Firestone, as of mid-March, had booked orders for some 20% of its capacity (about 26,000 tons on an annual basis). Firestone also had agreed to buy 1,200 tons a month of GR-S for its Los Angeles tire plant to be delivered in May, June, and July.

Mr. Trainer offered the opinion that changes in the selling price of GR-S will be based—as in the past—on changes in the cost of producing butadiene and styrene and in the cost of labor.

"It is to the interest of the rubber products manufacturer to have stability in the prices of the materials that they use. It will be to our interest to maintain a stable and uniform selling price of GR-S, in an effort to control fluctuations in the price of natural rubber."

Goodyear Tire & Rubber Co., Leland E. Spencer, assistant to the president: The two copolymer plants bought by Goodyear—one at Houston, the other at Akron—have a combined capacity of 114,800 tons. Goodyear will produce "all we can use or sell" up to that figure and make "not less than 11,500 tons" available to small business. The obligation to provide this quantity for small business, he said, is "binding equally with all other terms of the [plant purchase] contract, including the national security clause."

Goodyear has readied expansion plans and ordered equipment which, as a "first step," would add 10,000 tons to current GR-S capacity. The expansion will be undertaken "just as soon as the requirement justified such expansion." Goodyear will sell GR-S at 23¢ a pound—plus a "break-even" freight charge. It has agreed to purchase 1,000 tons in May from Shell, for its Los Angeles tire plant. The price of GR-S will bear "no relation" to the price of natural rubber, the witness said.

Texas-United States Chemical Co. (The Texas Co. and United States Rubber Co.), William P. Gee, president: The company bought a copolymer plant at Port Neches with a rated capacity of 88,000 tons, but plans to operate during the first year, starting in May, at 87,000 tons, increasing output if market conditions warrant. Texas-U. S. Chemical also owns an undivided half interest with Goodrich-Gulf in the Neches butadiene plant, a 205,000-ton unit.

Texas-U. S. will make available to small business 20% of its GR-S output—or 17,400 tons in the first year. New equipment

difficult extrusion shapes

are handled with

EASE
SPEED and
PRECISION

when you use

STATEX®M
FEF

the carefully controlled structure of this superior black helps you to do better work.

A COLUMBIAN COLLOID

COLUMBIAN CARBON CO. · BINNEY & SMITH INC.

MANUFACTURER DISTRIBUTOR

ISAF (Intermediate Super Abrasion Furnace)

STATEX®-125

HAF (High Abrasion Furnace)

STATEX-R

MPC (Medium Processing Channel)

STANDARD MICRONEX®

EPC (Easy Processing Channel)

MICRONEX W-6

FF (Fine Furnace)

STATEX-B

FEF (Fast Extruding Furnace)

STATEX-M

HMF (High Modulus Furnace)

STATEX-93

SRF (Semi-Reinforcing Furnace)

FURNEX®

COLUMBIAN CARBON CO. • BINNEY & SMITH INC.

MANUFACTURER DISTRIBUTOR

will be installed to diversify output—produce more polymer types, but no plans are in the offing to add to total capacity. Selling price of GR-S has not yet been set, but, said Mr. Gee, "We intend to be competitive." As for a change in the price of natural rubber, "I don't believe it would have any effect on GR-S prices."

Phillips Chemical Co., T. L. Cubbage, vice president and general manager: The company bought both a butadiene and a copolymer plant at Borger, Tex., the latter with a capacity of 63,000 tons a year. Phillips, however, plans to produce only 57,600 tons of GR-S—but will increase the variety of types produced to 21 or more. It still "will be necessary in order to meet the needs of our customers to make some trades with other plant owners. But except for such trades, we do not plan to sell any rubber to the Big Four. We do expect to sell about 30% of our estimated output to the small companies who are participating in American Synthetic and Copolymer Corp. The balance, 70%, will be sold to the non-integrated companies; that is, companies that will not own an interest in a copolymer plant." That 70%, Mr. Cubbage said, amounts to 40,320 tons.

Starting back in April, 1954, Phillips contacted 225 rubber fabricators in 17 or 18 states, offering GR-S at 25¢ a pound, delivered (giving Phillips a plant netback of about 23.5¢). Contracts are from one to five years' duration; the five-year contract permits price changes based only upon changes in the cost of labor, the commodities index, and raw materials—typical "escalator clause" factors.

Shell Chemical Corp., Richard C. McCurdy, president: Shell's contract (and bid) to buy the three Los Angeles plants as a single "package"—its refusal to assign a separate price to each of the three plants—provided the principal "sideshow" at the disposal hearings. Minnesota Mining & Manufacturing Co., its affiliate, Midland Rubber Corp., and Edwin E. Pauley, a part owner of Midland, had bid for the Los Angeles plants on a plant-by-plant basis. They argued that Shell's "package" bid of $27 million (later hiked to $30 million) was an impossible barrier to bids entered on an individual plant basis, when the idea was to try to top a competitor's bid to win the plant. Their other charge was that Shell, by entering such a bid, and the Commission, by accepting it, both violated the Disposal law's requirement that bidding be on a plant-by-plant basis.

This legalistic point (government lawyers contested it) scored heavily with the many lawyers now sitting in Congress. An effort to nullify the Shell contract, however, was beaten down by a 276-137 vote in the House; the contract survived by a narrower 48-39 margin in the Senate.

Through it all, Mr. McCurdy insisted that Shell bid as it did because the only proposition in which it was interested was to buy the three plants as a unit. Asked why he didn't assign a separate price tag to each of them (along with his package bid offer), he invariably replied, "My conscience would not have permitted it."

If Shell bought the copolymer plant alone, it would be forced to shut it down in leaner times. But with the butadiene and styrene plants in its fold, he reasoned, Shell could justify keeping the copolymer plant operating under these circumstances [thus holding on to its skilled labor force] because alternate market outlets would be available to sustain a high level of production at the styrene and butadiene plants.

"Their integration is economic, operational, and in part physical. Taken together, they can form an economically healthy industrial plant. Separated, only one [styrene plant] is sound; while the other two become of doubtful value, either to the purchaser, or to this program as a competitive force. The copolymer plant," Mr. McCurdy went on, "is the only copolymer operation in California, and it presents some problems for its operator. The great bulk of the GR-S rubber consumed in the West is used by companies participating in this program, who will themselves hereafter be making GR-S rubber. All the rest of the western GR-S demand combined is equivalent to only about one-sixth of the rubber-making capacity—89,000 tons—of the Los Angeles copolymer plant. . . . In short, it is likely that the three different operations, run together, will in the long run afford the operator a reasonable chance to take the ups and downs in stride, and to compete on better terms with the more fortunately situated plants."

Shell saw this as the "solution to the California problem" and felt someone should buy all three units "in the best interests of the Disposal law. Feeling this way, Shell could not associate itself with the purchase of any part of this complex, only the whole."

Shell's final offer of $30 million, which topped the next highest by $6 million, was the only proposal not specifying as a condition of sale that two or more of the Big Four tire plants guarantee to buy GR-S from the Los Angeles copolymer plant. Shell, Mr. McCurdy said, is hopeful that the Big Four will become permanent major customers for his rubber—but so far, he said, "I have an eight months' contract from one of them, a three months' contract from another one, and a one month from another one, and we are talking to a fourth one. I have to sell to the large rubber companies out there to get along."

Reni Photos

Senator Price Daniel (Dem., Tex.) before Senate Banking & Currency committee; J. H. Faull, Jr., consultant to Baytown Rubber & Chemical Co., on right

In its purchase contract with the Commission, Shell took on the obligation, he said, "to flood the whole western part of the United States with rubber, and we have about half again as much capacity as would be required to do that. We have already sold and are negotiating for approximately 18,000 tons of rubber outside of the four big rubber companies. We have sold 12,400 firm, and we are working on another 5,600 now."

Shell has contacted 190 rubber fabricators—all it could find in the West—and "told them that we wanted their business; that our price would be 23¢, and they wouldn't be charged an artificial freight like the government has been charging them [the government's uniform freight charge of 1.1¢ a pound]."

Of the 18,000 tons, half is directed at participants in American Synthetic or Copolymer Corp., and half is with firms which have no interest in a copolymer plant. Shell has pledged to make available to small business on the West Coast a minimum of 9,000 to 10,000 tons and another 10,000 tons will be surplus to all West Coast needs and available for shipment east to other small business firms. Shell has no firm expansion plans, "although we hope to put in a latex plant" at the Los Angeles, California, facility.

Esso Standard Oil Co., O. V. Tracy, general manager, chemical products department, and president of its marketing affiliate, Enjay Co., Inc.: Esso and Humble Oil & Refining Co., both affiliates of Standard Oil Co. (N. J.), bought the two Butyl rubber plants—at Baton Rouge and Baytown, respectively. Their combined capacity is 90,000 tons.

Demand for Butyl—because of the loss of the inner tube market to the tubeless tire—"has dropped down very radically in the past year." As a result, Mr. Tracy said the two plants together plan to produce only 55,000 tons in 1955 [average output in the previous four years was 73,081 tons—with 90% of it going to inner tubes]. Mr. Tracy told the Senate Banking committee earlier in the week that 1955 Butyl consumption will amount to only 49,000 tons.

"I may say," he told the Senators, "that this drop largely developed after we had put in our bid for these plants (May, 1954), and there were some rather embarrassing questions asked by our top-level management as to what happened to it."

At least 10,500 tons of Butyl rubber will be made available to the small business firms.

Enjay, which will market both Esso's and Humble's Butyl outside of Texas, has offered Butyl at 23¢ a pound, f.o.b. producing plant, to some 1,000 rubber consuming firms. It considers Butyl competitive with both GR-S and natural rubber in a great many uses and does not believe that a decrease in the supply of natural or an increase in its price will have any effect on the selling price of Butyl.

Three Plants Not Sold; Baytown Renegotiation Begins

Completion of the disposal program still left three rubber plants under government ownership. One, the 60,000-ton alcohol butadiene plant at Louisville, Ky., was leased to Publicker Industries, Inc.; while the other, the 44,000-ton Baytown, Tex., copolymer plant has been reoffered for sale. The third, the long-idle, high-cost Institute, W. Va., copolymer plant appears doomed to continue indefinitely in "mothballs." It was the only plant for which no bid was offered.

Publicker, on April 4, took over the Louisville plant under a three-year lease, containing a national security clause and permitting government recapture. Terms provide a minimum guaranteed monthly rental of $1,000 and payment to the government of $6 for each ton produced. Publicker will be reimbursed, at cost, for plant protection and maintenance service. While designed at 60,000 tons, the plant actually can run at 87,000 tons. Publicker, a giant in the industrial alcohol field, hopes to be able to produce butadiene at prices competitive with petroleum butadiene. It has one eye on the synthetic rubber market and the other on the chemicals industry—a largely untapped, but highly promising outlet for butadiene.

Special legislation cleared the way for reopening bidding on the Baytown plant. The Baytown Rubber & Chemical Co., a local business group organized for this purpose, already has tossed its broad-brimmed Stetson into the ring, pledging to enter a bid returning "full, fair value" to the government. In last year's disposal program, only one bid was received for this plant—the $2,486,448 offered by The General Tire & Rubber Co., its present operator. The Commission turned it down as too low and rang up a "no sale" sign after making a fruitless effort to find another buyer in the Midland Rubber Corp., part of a group which had been outbid for the Los Angeles copolymer plant.

Federal Facilities Corp. will keep Baytown operating (if it can get the butadiene), pending the outcome of the Commission's new effort to sell it.

Whoever buys will have to pay for the $316,000 in "net additions" installed at the plant in the past few months.

Other Industry News

Colored Tires Being Offered by U. S. Rubber

Colored tires to harmonize with the lush color styling of the new 1955 automobiles are now being produced by United States Rubber Co., New York, N. Y. Available in muted tones of blue, brown, and green, the tires will be offered only in the firm's Royal Master white sidewall tubeless line.

The color extends from the outer edge of the white sidewall to the top edge of the tread, with a thin, similarly colored metallic trim beween sidewall and hub. The tread remains black to maintain its wearing quality.

The colored swathe, a 50-50 blend of neoprene and natural rubber, is about as thick as the white sidewall section. The tires will be available in replacement models only at about a 17½% increase in price. Dealers will receive moderate quantities of the tires some time this month. The company says it has adequate production equipment to meet the huge demand expected to be stimulated by its forthcoming advertising campaign in consumer magazines and on television.

Blue, brown, and green were chosen as basic colors to harmonize with 90% of the colors now being used on automobiles. Eventually other colors are expected to be added, but U. S. Rubber feels that the three colors are a good starting point to test consumer reaction. Too great a variety of colors at this stage would have overburdened dealers' inventories, the company explained.

Marcia Gottschall, U. S. Rubber tire designer, who helped develop the new colored tires

At a press conference held in connection with the announcement of these colored tires, at the Metropolitan Club, New York, March 15, Howard N. Hawkes, vice president and general manager of the company's tire division, said the advent of color will probably bring about a change in tire buying habits. From now on, women will have a much greater voice in tire purchases, combining styling and color with mileage and safety features.

Much of the credit for the development of colored tires, it was said, must go to a woman tire designer, Marcia Gottschall, in the company's Detroit plant who experimented with more than 30 different hues before selecting the present production models. Miss Gottschall is also credited with the development of the unique "scuff-guard" used on U. S. Royal Master tires to protect white sidewalls from getting dirty when rubbing along curbs.

New Goodyear Plant

A new tire plant will be built in Venezuela by The Goodyear Tire & Rubber Co., Akron, O. To be located near the town of Valencia, about 100 miles from Venezuela's capital city of Caracas, the plant will have an initial production capacity of 500 tires a day; it is expected to be in operation by the end of 1955.

This will be the company's thirty-ninth production unit, its seventeenth abroad, and its seventh in Latin America. Goodyear currently has factories in Argentina, Brazil, Colombia, Cuba, Mexico, and Peru.

Construction work on the new plant and the first stages of production will be under the direction of American engineers and technicians.

Steel Cord for Tires

A brass-plated steel-wire tire cord that is said to make tires blowout-proof has been developed by the wire rope division of Jones & Laughlin Steel Corp., Muncy, Pa. The concept was first projected in 1940, but had to await the end of World War II for further development, according to the company.

The wire cord is strong and lightweight and is expected to find application as a reinforcement agent in other rubber goods, as well as in non-rubber materials, such as plastics. Jones & Laughlin does not reveal whether the cord is currently available in commercial quantities for tire manufacture. This cord has, however, been incorporated into power transmission belts and conveyor belts.

Wins Safety Award

B. F. Goodrich Chemical Co., Cleveland, O., has bestowed its annual intra-company safety award, the President's Cup, to its Louisville, Ky., plant for 2½ million man-hours of operation without a lost-time accident. The plant also received four other safety awards from the Louisville Safety Council.

Goodyear Tubeless Now In Entire Truck Line

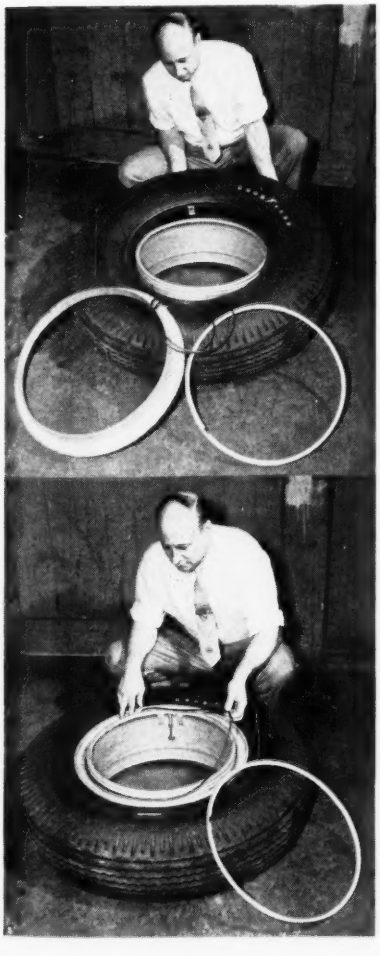
Reviewing its progress in the tubeless truck tire field, Goodyear Tire & Rubber Co., Akron, O., reports that the tubeless has now been introduced into its entire line, ranging from pickup trucks to tractor trailers and earthmovers. The company, claiming to be the world's largest builder of truck tires, attributes these strides to both its development of the 3-T triple-tempering cord process and its Tru-Seal rim.

The first made possible the building of an integrally airtight tire without a tube-like liner and in the same price levels for conventional passenger and tire tube combinations, Goodyear says. A tire that was lighter in weight and cooler running, could be mounted easier, permitted more recaps, wore longer, and replaced the quick blowout with a slow leak, were advantages stemming from this development.

The Tru-Seal rim is said to have solved the problem of adapting the tubeless principle to heavy-duty, dual-bead truck tires without modifying the design of the tire itself. The rim is a three-piece assembly with a small rubber ring which locks in the air, making it adaptable to all sizes of truck tires.

With the formerly used drop-center rim, the limit in efficient performance was apparently reached at the 10.00-20 size, Goodyear states, and the basic design problem was to find a way of putting a truck tire and rim into the space once occupied by the tire itself. If the tire were made smaller on the inside, it would interfere with the brake drum; if made larger on the outside, it would conflict with vehicular clearances. The Tru-Seal design is said to have made no sacrifice in size, cushioning, or service.

The rim includes full flange height and full flange support, according to the company, maintains the tubeless's weight saving, and simplifies tire mounting; the valve is fastened in the rim. Several large trucking companies are already using the rim assembly in regular cross-country hauls.



(Top) Tubeless tire being slipped over base of Goodyear's Tru-Seal rim assembly; (Bottom) Rim being sealed with rubber ring; lock ring, final piece of Tru-Seal assembly, will be clamped over rubber ring

Hose Anti-Mildew Agent

A new mildew-resisting, waterproofing material has been developed by The B. F. Goodrich Co. Industrial Products Division, Akron, O., for application to fire hose jackets. Known as Superseal, the material is said to resist moisture absorption and mildew attack ten times more effectively than any other method.

Mildew-rotting of fire hose jackets is the principal cause of fire hose failures resulting from absorption and retention of moisture, the company says. Other advantages claimed for Superseal-treated hose are the maintaining of flexibility in freezing weather, and a weight-saving resulting from the non-absorption of water.

The Superseal treatment is available in all sizes of fire hose used by municipal fire departments, in industry, institutions, forestry, and military use. Treated covers are light brown in color and feel drier than conventional water-repellent agents, Goodrich states.

Sagues Heads Sacomo

Victor Sagues has become president of the newly reorganized Sacomo Mfg. Co., San Francisco, Calif., producer of mechanical packings, molded rubber goods, and asbestos textiles. He is a former partner of the firm. John B. Davis has been named sales manager; John B. Crawford, production manager; and Jim Williams, factory representative in the southern California area.

According to Mr. Sagues, the company plans to render a technical advisory service to customers and prospects. The plant's improved processes, facilities, and engineering planning service will enable the trade to receive tailor-made solutions to manufacturing requirements, he further declared.

Sacomo was formed seven years ago as an outgrowth of the Plant Rubber & Asbestos Works, which had been in business in San Francisco for more than 21 years.

Moulin Studios

Victor Sagues

Columbia-Southern Scholarship Committees

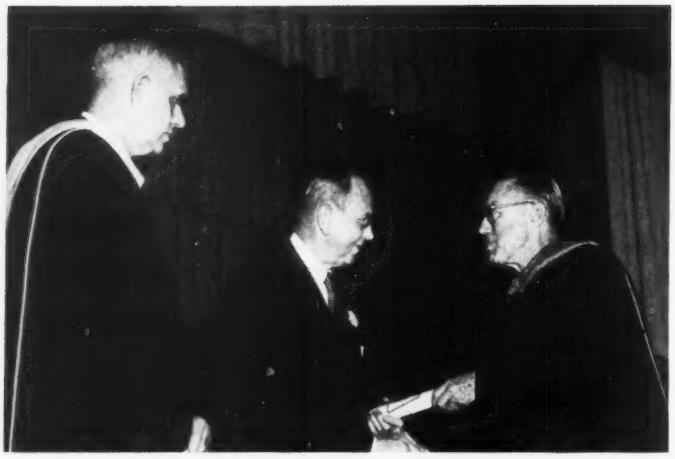
Three three-member scholarship award committees have been selected by Columbia-Southern Chemical Corp., Pittsburgh, Pa., to determine the winners of its $4,000 science and engineering scholarships that will be distributed this spring at three of its plant towns, according to E. T. Asplundh, president of the firm.

Eligible for the four-year awards are graduating male students of high schools in the Natrium, W. Va., Corpus Christi, Tex., and Lake Charles, La., areas, who are sons of company employes. Applicants must rank in the upper-fifth of their class. Students selected are expected to take college or university majors in chemistry, or chemical, mechanical, civil, or electrical engineering. One award will be given to each plant area.

The purpose of the awards, Columbia-Southern reveals, is to stimulate interest and encourage talented students to become better equipped for careers in American industry, now faced with a serious shortage of science and engineering personnel.

Goodyear Builds Warehouse

Construction has begun on The Goodyear Tire & Rubber Co.'s new Columbus, O., warehouse and office building. The one-story masonry and steel structure will contain 44,000 square feet of floor space and have air-conditioning and sprinkler systems and a large paved parking area. Freight loading and unloading facilities are to be provided for both rail and trucking. The building will be served by a siding of the New York Central Railroad. Completion of the project is expected this summer.



Left to right, **Henry T. Heald, Chancellor of NYU; Herbert F. Van Valkenburgh; Thorndike Saville, Dean of the College of Engineering**

Van Valkenburgh Honored

Herbert F. Van Valkenburgh, vice president of purchasing for Dunlop Tire & Rubber Corp., Buffalo, N. Y., has received the New York University College of Engineering Centennial Award for "professional achievement and service." The honor was conferred during the University's Mid-Winter Convocation, part of a program of events in celebration of the College's one hundredth anniversary.

Mr. Van Valkenburgh has been associated with Dunlop since 1920 and became vice president in 1946. He is a graduate of NYU, Class of 1906.

Installs Glass Piping

Pyrex glass pipe for handling latex has been installed in the plant of Kentucky Synthetic Rubber Co., Louisville, Ky., the company reveals. Formerly steel piping had been used in the plant's coagulation area, but these proved too susceptible to clogging.

The glass piping is said to be advantageous by providing a smooth interior that resists the building up of rubber. Also, the transparency of the lines enables operators to see what is causing a sluggish flow of the material.

The Pyrex pipe is the first to be used for this purpose in the industry, Kentucky says.

Buys Lastex Facilities

United States Rubber Co., New York, N. Y., has acquired the productive facilities of Para Thread Co. of North Carolina, Inc., Raeford, N. C., producer of Lastex yarns. The plant is a one-story structure with 23,000 square feet of manufacturing and warehousing space and is situated on eight acres of land. The facilities will be used for Lastex yarns for the weaving and knitting trades, including such products as corsets, swimsuits, underwear, hosiery, and shoes, the company says.

To Market Fortisan-36

Full-scale commercial production of Fiber X-36, a super-strong industrial fiber which has been under development and evaluation for the last four years, will begin before the end of 1955 at Celanese Corp. of America's Rome, Ga., fiber manufacturing plant, according to Harold Blancke, president of the firm.

The fiber, chemically akin to Fortisan, Celanese's regenerated cellulose yarn first produced in 1940, will be marketed as Fortisan-36 in continuous form in the 800-denier size, Mr. Blancke revealed. Other heavy-denier sizes may be made later.

The new product is said to fill an existing gap between high-tenacity rayon on the one hand and glass fiber and industrial steel wire on the other. Fortisan-36 is reported to have properties of great strength, low elongation, and dimensional stability, and it is expected to find ready application in such fields as power transmission belting, high-pressure hose, fire hose, conveyor belts, webbing, body armor, and backing for heavy-duty carpets. Sample quantities from present pilot operations are available.

Molding Firm Expands

Pacific Moulded Products Co., Los Angeles, Calif., (a corporation) has announced its acquisition of the assets of Pacific Moulded Products Co., Los Angeles (a partnership). According to Volney S. Anderson, executive vice president of the rubber company, no changes in personnel or in overall policies are contemplated.

The firm's present plans call for expansion in the extruded rubber products field and for a wider line of propriety products. The company also reports an annual sales volume of more than $1,000,000.

Volney S. Anderson, Theodore L. Tafe and Clyde E. Wilson, former executives of the partnership, were elected executive vice president, vice president for sales, and vice president for production, respectively. Charles D. Thurmond was elected vice president and secretary. Kenneth R. Simpson, Jr., is board chairman.

Isocyanate Price Down

Polyurethanes have been given strength on the competitive foam market by a reduction of the price of two isocyanate compounds announced by Mobay Chemical Co., St. Louis, Mo. Mondur TD, a mixed isomer tolylene diisocyanate, used in the manufacture of flexible and other types of polyurethane foams, has been cut from $1.40 to $1.20 a pound in 55-gallon lots, and Mondur TDS, a 2,4 isomer tolylene diisocyanate, used to make rigid polyurethane foams, has been reduced from $2 to $1.50 a pound in similar lots. Smaller amounts have been correspondingly reduced.

Organizes Canadian Firm

Yale Rubber Mfg. Co., Sandusky, Mich., has opened a new plant in Kincardine, Ont., Canada, to be known as Yale Rubber Mfg. Co. of Canada, Ltd. President and general manager of the new facilities is Lyle F. Runciman, with Eldon H. Henderson, executive vice president, E. Noel Lee, vice president in charge of sales, Ray O. Brooks, vice president in charge of production, and Russell C. Henderson, secretary and treasurer.

Production will get under way in May. Three hundred are expected to be employed.

Yale Rubber manufactures molded, extruded, or calendered rubber products, mostly custom manufactured to specifications for all types of industry.

Firestone Stands Pat On One-Piece Rim

The Firestone Tire & Rubber Co., Akron, O., remains firm in its conviction that the one-piece drop-center rim assembly for its tubeless truck tire is the simplest applicable apparatus to install and the best weight-saver, according to H. D. Tompkins, vice president in charge of trade sales.

"Because it saves weight over tire and tube assemblies or tubeless tires on multi-piece rims, the drop-center rim and tubeless truck tire give the trucker more payload per mile," Mr. Tompkins recently said. "In addition, the one-piece drop-center rim is simpler to mount than either the six-part tire and tube assembly or a four-part rim for tubeless tires. This results in the reduction of servicing time and costs for the truck operator."

Mr. Tompkins believes that Firestone's tubeless truck tire and drop-center rim are the most practical and economical assembly for 85% of the trucks now on the road. For larger, high-ply tires where mounting is difficult, the company is continuing its method of sealing tubeless tires to multi-piece rims.

The decision to continue production of the one-piece rims was made after careful evaluation of both single and multi-types, Mr. Tompkins explained. Truck manufacturers and fleet operators were consulted, and their opinions taken into consideration.

Cites A-C Polyethylene

A-C Polyethylene, a low molecular weight polyethylene, has proved to be an excellent mill and calender release agent for neoprene and "Hypalon" compounds, especially when roll temperatures exceed 140° F., according to Semet-Solvay Petrochemical Division, Allied Chemical & Dye Corp., New York, N. Y., producer of the material.

Neoprene Type WHV, for example, handles easier at temperatures as high as 200° F., the company says, and with Neoprene Type WRT thread compound, the polyethylene eliminates roll sticking when calenders are at temperatures of 165-225° F. Easy sheet release of "Hypalon" stock from rolls at temperatures of 225° F. is also reported.

The material is also said to be advantageous because it does not cause shrinking, does not mar the smooth finish of the calendered sheet, and has no adverse effect on curing.

Dayton Loom Straps

Substantial savings have been incurred by more than 100 U. S. textile plants through the use of rubberized check straps for looms instead of the conventional leather variety, according to The Dayton Rubber Co., Dayton, O., manufacturer of the synthetic rubber and fabric straps, said to be the first of their kind made.

The straps check the force of the shuttle hitting the picker as it flicks across the loom as many as 210 times a minute. Leather straps last a maximum of 6,000 loom hours; while the rubberized kind endure a minimum of 9,000 to 10,000 loom hours, Dayton reports. Strap costs are said to be reduced 25-50%, and savings in labor and maintenance are also effected.

National Aniline Building W. Va. Isocyanate Plant

A multi-million-dollar plant for the large-scale production of isocyanates will be built at Moundsville, W. Va., by National Aniline Division, Allied Chemical & Dye Corp., New York, N. Y. Expected to be completed in early 1956, the plant will get all its raw materials from within the company organization.

A varied line of isocyanates, including the di-isocyanates of toluene (TDI), di-tolyl (TODI), and diphenylmethane (MDI), will be produced. Isocyanates, together with polyesters, are the basic ingredients for the manufacture of polyurethanes, a relatively new class of synthetic organic materials that are currently engaging the interest of major American chemical companies.

The new plant will be located on the Ohio River and will adjoin two plants of Allied Chemical's subsidiaries, Solvay Process Division's new chlorine, caustic soda, and chlorinated methanes plant, and National Aniline's own recently completed maleic anhydride, fumaric acid, and catalytic aniline plant.

Shipping will be done by river barge, railroad, and truck.

National Aniline also plans to provide a full range of coloring materials for the new foams and other polyurethane products.

Design and construction of the plant will be under the supervision of F. J. Krueger, manager of the division's engineering department.

Schneider Mfg. Dissolved

Schneider Mfg. Corp., Muncie, Ind., a wholly owned subsidiary of Westinghouse Electric Corp., has been dissolved to form the hydraulic drives department of the Westinghouse gearing division. Schneider had been purchased in October, 1954.

The new department will sell, engineer, and manufacture hydraulic torque converters and associated brakes and transmissions, primarily for industrial applications. Its headquarters will remain at Muncie.

L. R. Botsai heads the gearing division. New appointments to the department include S. M. Johns, sales manager; T. P. Dunkin, manager of manufacturing; and P. L. Fosburg, engineering manager.

Armstrong Dip Unit

A $750,000 latex dip unit for prestretching nylon or rayon tire cord in one continuous, automatically controlled operation has been installed by Armstrong Rubber Co., West Haven, Conn. The unit covers two floors of the plant, includes gas-fired ovens for drying, and can stretch the fibers under tensions up to 10,000 psi.

According to the company, the new latex dip unit eliminates the danger of heat growth by giving synthetic fibers the extremely high tensions necessary to take the stretch out of the material before it goes into the tire. The unit's operation, like other similar equipment, involves a tension, temperature, and time tempering of the fibers.

Thiokol Aids Map Casting

Polysulfide liquid polymer is being used to cast flexible relief maps and the molds needed for their manufacture, according to Thiokol Chemical Corp., Trenton, N. J., producer of the material. The maps are made by Aero Service Corp., Philadelphia, Pa., for employment by the U. S. Air Force in the training of flight personnel in the radar recognition of topographical features.

The liquid polymer is blended with fillers and catalyst and requires several hours to set at room temperature. Shrinkage is less than 0.5%, and the resulting resilient cast exhibits a high degree of definition, is water resistant, has good radar wave reflectance characteristics, stores well, and is not subjected to disrupting residual stresses, it is claimed. Production cost is said to be low.

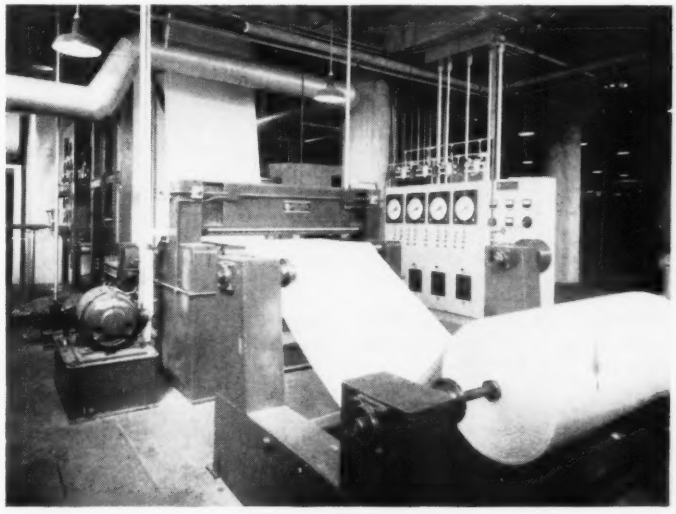
A plaster model of the relief map is first sprayed with a layer of wax to provide easy separation. The liquid polymer mixture is poured on to the model, leveled off, and backed with fiber glass material. After setting, the cast is stripped off. Relief maps as large as 324 square feet have been made.

Test Fleet Awarded

Safe driving awards for 1954 were presented to 88 drivers of its test fleet by Armstrong Rubber Co., West Haven, Conn., at a banquet held recently at San Antonio, Tex., the site of the company's "Devil's Causeway", a 340-mile stretch of modern highways and gravel roads used to test the performance of Armstrong's tires.

C. K. Novotny, vice president of the firm, presented the awards. Other of the firm's speakers included H. A. Haidet, M. D. Gatton, and F. R. Vernotzy.

Consisting of 33 vehicles and a staff of 120, the test fleet operates on a 24-hour-a-day schedule with three eight-hour shifts and is said to be the largest in the industry.



A section of Armstrong's new latex dip unit

Farrel-Birmingham Elects

Franklin Farrel, 3rd, has been elected president of Farrel-Birmingham Co., Inc., Ansonia, Conn., succeeding Franklin R. Hoadley, president since 1945, who will retire this May in accordance with the provisions of the firm's retirement pension plan. Mr. Farrel is the fourth generation of his family to be actively associated with the company, which was founded by his grandfather and great grandfather.

Franklin R. Hoadley

Franklin Farrel, 3rd

Reelected chairman of the board is Alton Austin Cheney. Austin Kuhns is again chairman of the finance committee. Also elected were Edward S. Coe, Jr., Robert M. Honegger, and Joseph LeMay, vice presidents; and Julius G. Day, Jr., secretary and general counsel.

News about People

A. G. Treadgold has been promoted to vice president for manufacturing and shipping of United Carbon Co., Inc., Charleston, W. Va. Also advanced were **I. Drogin,** to vice president in charge of technical sales; and **Grant Thomas,** to vice president for sales. **Arthur Hanson** has been appointed administrative vice president in United Carbon's oil and gas division, United Producing Co., Inc., and **H. L. Hester** has been named its assistant secretary.

A. M. Powell has been named assistant production manager in charge of eastern sulfur and insecticide plants for Stauffer Chemical Co., New York, N. Y.

Paul Brna has been appointed engineering representative in the mid-continent area for Rhodia, Inc., New York, N. Y.

L. L. Shailer, Sr., has been named product engineer in charge of sales development of hydrophilic polymers at B. F. Goodrich Chemical Co., Cleveland, O., and **R. E. Score, Sr.,** has been made product engineer in charge of sales development of surfactant materials.

J. S. Wolff has been named biochemical sales development manager of B. F. Goodrich Chemical Co., Cleveland, O.

Robert C. Stranahan has been promoted to manager of merchandise distribution, metal products division, Goodyear Tire & Rubber Co., Akron, O.

M. N. Gaboury has been named manager of manufacturing for the organic chemicals division of American Cyanamid Co., New York, N. Y.; **F. B. Manker** has been appointed manager of the firm's Bound Brook, N. J., plant; and **R. N. Paulson** has become assistant manager of the management services department of the division.

H. W. Dodenhoff has been appointed manager of truck tire sales; **J. F. Arthur,** manager of fleet sales; and **C. E. Drennen,** manager of national accounts for United States Rubber Co., New York, N. Y.

Oscar W. Kaalstad has become eastern sales representative for Dewey & Almy Chemical Co., Cambridge, Mass.

Sidney S. Goodwin has been elected a director and **Lindsay F. Johnson** a vice president of New Jersey Zinc Co., New York, N. Y.

Martin F. Wilkerson has been named manager of the Houston, Tex., branch sales office of Diamond Alkali Co., Cleveland, O.

Richard F. Cassidy has been appointed production superintendent for the New Martinsville, W. Va., plant of Mobay Chemical Co., St. Louis, Mo.

Rex Rainey has become chief engineer of the oil seal division of Yale Rubber Mfg. Co., Sandusky, Mich. He was formerly vice president and general manager of Allis Seal Corp., Chicago, Ill.

Colin M. Ford has joined Seiberling Rubber Export Co., Akron, O.

Philip G. Connell, Jr.

Philip G. Connell, Jr., has been appointed manager of rubber chemicals sales for American Cyanamid Co., New York, N. Y.

Clyde A. Case has been named central manager of the pigment, color, and chemical division of The Sherwin-Williams Co., Cleveland, O.

W. F. Munnikhuysen has been elected chairman of the board, and **Fred C. Foy** president and chief executive officer, of Koppers Co., Inc., Pittsburgh, Pa. Associated with the company since 1916, Mr. Munnikhuysen was formerly vice president and general manager of the firm's wood preserving division and Koppers' executive vice president since 1950. Mr. Foy joined Koppers in 1948 and has been vice president and general manager of the company's tar products division since 1950. Also elected was **R. R. Holmes,** now vice president and general manager of the tar products division.

William O'Neil, president of The General Tire & Rubber Co., Akron, O., has been nominated to Honorary Commander of The Mexican Legion, a social organization dedicated to fighting Communism by raising the standard of living of the poor.

Lawrence D. Walker has been named technical director of Peters Mfg. Co., Wollaston, Mass.

Charles R. Haynes, former secretary of the Division of Rubber Chemistry, A. C. S., has become associated with National Polychemicals, Inc., Wilmington, Mass., according to Edward V. Osberg, president. Mr. Haynes, who retired as manager of rubber technical service of Binney & Smith Co. in 1954, brings with him an extensive background based on 50 years of experience in the rubber and chemical industries. He will assist National Polychemicals in its technical and sales activities as these relate to the rubber industry.

Christopher P. McCarthy has been named sales manager for Beacon Falls Rubber Footwear, Beacon Falls, Conn.

Sam Tanney has been elected president, and **Sidney Friedman** vice president of the Scrap Rubber & Plastics Institute of the National Association of Waste Material Dealers, Inc. **Manny Mighdoll** has been named secretary.

L. C. Duncan has been named general manager of the Lederle Laboratories Division of American Cyanamid Co., New York, N. Y., and **V. E. Atkins** has been appointed general manager of the organic chemicals division, with **D. M. Benjamin** becoming assistant general manager.

Edward T. Day has been appointed general sales manager of the mechanical goods division of United States Rubber Co., New York, N. Y., and is succeeded to the post of manager of branch sales for the division by **Purdy Miller,** formerly sales manager of molded goods.

Ted A. Ruble has been named assistant vice president of Continental Blacks, Inc., with headquarters at Amarillo, Tex.

H. L. Gross has joined S & F Chemical Co., Inc., Nashville, Tenn., as chemical engineer in charge of product development and technical sales.

Louis A. Fisher has been elected a director of The Eagle-Picher Co., Cincinnati, O. He is president of Fabricon Products Division and a vice president of Eagle-Picher.

Charles O. Koch has been named technical service superintendent for the New Martinsville, W. Va., isocyanate plant of Mobay Chemical Co., St. Louis, Mo.

Paul C. Panagiotakos has been appointed director of sales for National Polychemicals, Inc., Wilmington, Mass. He has been associated with New England Tape Co., Inc., Dewey & Almy Chemical Co., and Lowell Textile Institute and was chairman of the chemistry department of New England College of Pharmacy.

J. Stanley Martin has joined Hewitt-Robins, Inc., Stamford, Conn., as a field engineer specializing in the sale of industrial rubber products.

Kyle L. Menuez has been appointed vice president, general manager, and member of the board of directors of Henrite Products Corp., Ironton, O. Formerly general manager of the mechanical rubber goods department of Ball Bros. Co., Inc., Mr. Menuez has been associated with the rubber industry for 20 years.

A. Eugene Schubert has been named manager of engineering, chemical materials department, General Electric Co., Pittsfield, Mass. He joined the company in 1942 and became head of the chemical process section of its research laboratory in 1945.

Theodore C. Ohart has been appointed marketing manager of the silicone products department of General Electric Co., Schenectady, N. Y. He has been with the company since 1929, except for a five-year stint with the U. S. Army's Ordnance Department.

Louis F. Weyand has been named sales director of Minnesota Mining & Mfg. Co., St. Paul, Minn., succeeding **George H. Halpin,** who will remain active as a consultant. Both men are executive vice presidents and directors of the firm. Mr. Weyand joined the company in 1915.

News Briefs

National-Standard Co., Niles, Mich., has named four new executive officers to management positions: James A. Mogle, Jr., vice president, purchasing and reciprocal relations; Thomas H. Pearce, vice president, engineering and operations; William D. Peace, assistant vice president, bead wire and hose wire sales; and George Hussey, Jr., secretary and assistant to the president.

Rubber Age has moved its offices from 250 W. 57th St., New York 19, to 101 W. 31st St., New York 1, N. Y.

Wooster Rubber Co., Wooster, O., has distributed to retail salesmen handling its houseware products the first issue of a pocket-size quarterly, "Rubbermaid Re-Tales," to keep them informed on company goods for more effective selling. The booklet also contains feature items of interest to women.

The Goodyear Tire & Rubber Co., Akron, O., and the United Rubber Workers, CIO, have obtained the services of William E. Simkin as impartial labor arbitrator. Mr. Simkin previously served both organizations in the same capacity between 1945 and 1951.

The Ninth National Chemical Exposition will be held in Cleveland, O., November 27-30, 1956, under the joint auspices of the Chicago and Cleveland sections of the American Chemical Society.

United States Rubber Co., New York, N. Y., claims a world record for tonnage hauled for a 60-inch wide, quarter-mile long conveyor belt it built in 1939 for Chile Exploration Co., Chuquicamata, Chile. Operating in strong sunshine at 10,000 feet elevation in the Andes Mountains, the belt carried 131,000,000 tons of copper ore before being retired from service recently.

The Toy Manufacturers of the U.S.A., Inc., held its annual American Toy Fair at the McAlpin and New Yorker Hotels, New York, N. Y., March 7-16, at which a record 1,400 exhibitors displayed their wares.

Pontiac Motor Division, General Motors Corp., Pontiac, Mich., has installed 20,000 square feet of Koroseal lining material to protect the steel tank walls of its new bumper-plating machine.

The World Plastics Fair & Trade Exposition scheduled for the National Guard Armory, Los Angeles, Calif., has moved back its opening from April to October 5-9 to provide manufacturers with more time to prepare their exhibits.

United States Rubber Co., New York, N. Y., has given its annual George Mikan award for the most improved college basketball team in the country to the University of San Francisco's Dons, this year's winner of the National College Basketball Championship.

Financial

Armstrong Cork Co., Lancaster, Pa., and domestic subsidiaries. For 1954: net earnings, $11,913,676, equal to $7.34 a common share, compared with $9,264,978, or $5.84 a share, the year before; net sales, $217,557,305, against $217,484,369; federal income taxes, $12,400,000, against $11,170,000.

Sidney Blumenthal & Co., New York, N. Y. For 1954: net loss, $1,608,327, against net profit of $99,935 in 1953.

Borg-Warner Corp., Chicago, Ill. For 1954: net income, $24,460,075, equal to $9.80 a common share, against $23,978,-142, or $9.77 a share, in 1953; sales, $380,317,341, against $407,379,056.

Columbian Carbon Co., New York, N. Y. For 1954: net income, $4,558,718, equal to $2.83 a share, compared with $5,194,501, or $3.22 a share, in 1953.

Cooper Tire & Rubber Co., Findlay, O. For 1954: net profit, $125,041, equal to 80¢ a common share, contrasted with $359,-285, or $2.29 a share, the year before.

Dayton Rubber Co., Dayton, O. Three months ended January 31, 1954: net income, $416,671, equal to 67¢ a common share, contrasted with $155,936, or 23¢ a share, a year earlier; sales, $14,252,951, against $12,030,814.

DeVilbiss Co., Toledo, O. For 1954: net earnings, $786,197, equal to $2.62 a share, against $739,422, or $2.46 a share, in 1953.

Diamond Alkali Co., Cleveland, O., and subsidiaries. For 1954: net profit, $5,528,-600, equal to $2.21 a common share, compared with $5,939,189, or $2.39 a share, the year before; net sales, $93,505,-530 (a new high), against $86,734,279; federal income and excess profits taxes, $4,-863,164, against $5,281,237.

Firestone Tire & Rubber Co., Akron, O., and subsidiaries. Quarter ended January 31, 1955: net income, $10,536,211 equal to $1.30 a common share, against $9,416,027, or $1.18 a share, in last year's quarter; sales, $247,790,647, against $218,190,068.

Garlock Packing Co., Palmyra, N. Y. Year ended December 31, 1954: net income, $967,186, equal to $2.31 a share, compared with $1,268,751, or $3.03 a share, in the preceding year.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and consolidated subsidiaries. Year ended December 31, 1954: net income, $344,386,015, equal to $7.33 a common share, contrasted with $235,-565,266, or $4.94 a share, in 1953; net sales, $1,709,255,247, against $1,765,432,-024; provision for federal income taxes and renegotiation, $258,290,000, against $404,840,000.

Farrel-Birmingham Co., Inc., Ansonia, Conn., and susbidiary. For 1954: net income, $2,646,913, equal to $8.14 a share, compared with $2,021,625, or $6.22 a share, in 1953; net sales, $40,260,238, against $47,016,700; federal income taxes, $3,305,000, against $3,985,000; current assets, $18,490,637, current liabilities, $7,-578,161, against $20,085,445 and $9,809,-891, respectively, on December 31, 1953.

General Electric Co., Schenectady, N. Y. Year ended December 31, 1954: net profit, $212,613,221, equal to $2.46 a capital share, compared with $165,727,889, or $1.92 a share, the year before; sales, $2,959,077,548, against $3,128,127,301.

General Motors Corp., Detroit, Mich., and consolidated subsidiaries. For 1954: net income, $805,973,897, equal to $9.08 a common share, compared with $598,119,-478, or $6.71 a share, in 1953; net sales, $9,823,526,291, against $10,027,985,482.

The B. F. Goodrich Co., Akron, O., and subsidiaries. For 1954: net income, $38,815,737, equal to $4.40 a common share, compared with $34,226,745, or $4.08 a share, in 1953; net sales, $630,-670,600, against $674,613,276; income taxes, $36,474,000, against $53,863,000; current assets, $319,048,371, current liabilities, $93,415,617, against $315,951,473 and $105,581,406, respectively, at the end of 1953.

Goodyear Tire & Rubber Co., Akron, O., and subsidiaries. Year to December 31, 1954: net profit, $48,055,196, equal to $5.04 a common share, against $49,323,-167, or $5.10 a share, in the preceding year; net sales, $1,090,094,050, against $1,210,508,783; income taxes, $43,372,000, against $68,449,753; current assets, $468,-872,166, current liabilities, $106,817,786, against $463,940,967 and $62,475,598, respectively, on December 31, 1953.

Jenkins Bros., New York, N. Y. For 1954: net earnings, $777,991, equal to $6.10 a share, contrasted with $451,269, or $3.54 a share, the year before.

Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont. For 1954: net earnings, $2,476,961, equal to $8.48 a common share, contrasted with $4,797,-204, or $17.48 a share, in 1953.

Lee Rubber & Tire Corp., Conshohocken, Pa., and domestic subsidiaries. Quarter ended January 31, 1955: net income, $315,-718, equal to $1.12 a capital share, against $261,123, or 93¢ a share, in the 1954 period; net sales, $9,870,830, against $9,-047,976.

Mansfield Tire & Rubber Co., Mansfield, O. For 1954: net profit, $890,485, equal to $1.61 a common share, against $927,-005, or $1.68 a share, in 1953.

Minnesota Mining & Mfg. Co., St. Paul, Minn., and subsidiaries. For 1954: net profit, $24,624,225, a new high and equal to $2.95 a common share, compared with $17,977,771, or $2.14 a share, in 1953; net sales, $230,890,482 (another record), against $219,916,383; income taxes, $24,-500,000, against $31,200,000.

Monsanto Chemical Co., St. Louis, Mo., and consolidated subsidiaries. Fourth quarter, 1954: net income, $7,064,868, equal to $1.31 a common share, against $6,685,605, or $1.24 a share, in the 1953 period; net sales, $89,186,225, against $82,-221,542.

For 1954: net earnings, $23,700,510, equal to $4.39 a common share, compared with $26,283,205, or $4.88 a share, the year before; net sales, $341,822,557, against $339,425,418.

Mt. Vernon-Woodberry Mills, New York, N. Y. For 1954: net income, $737,-754, equal to $1.13 a common share contrasted with $1,653,518, or $2.56 a share, the year before.

National Automotive Fibres, Inc., Trenton, N. J. For 1954: net loss, $543,394, against net profit of $3,231,040 in 1953.

O'Sullivan Rubber Corp., Winchester, Va. For 1954: net profit, $68,149, equal to 9¢ a share, compared with $128,730, or 24¢ a share, a year earlier.

Parke, Davis Co., Detroit, Mich. For 1954: net earnings, $10,493,502, equal to $2.14 a common share, against $9,344,017, or $1.91 a share, in 1953.

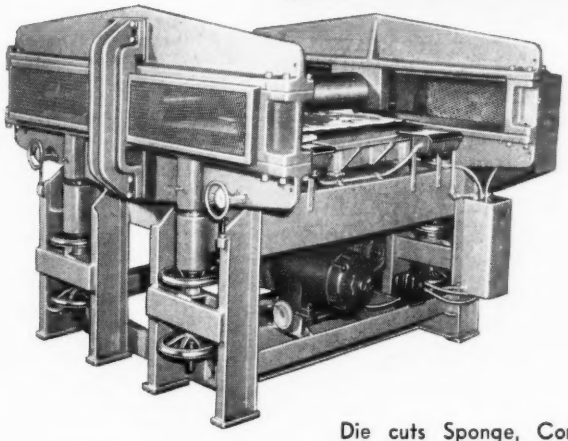
Phelps Dodge Corp., New York, N. Y. Twelve months to December 31, 1954: net earnings, $41,249,391, equal to $4.07 a share, against $38,878,733, or $3.83 a share, in the preceding 12 months.

Phillips Petroleum Co., Bartlesville, Okla. For 1954: net income, $76,234,679, equal to $5.20 a share, against $76,760,231, or $5.25 a share, in 1953.

(*Continued on page 116*)

SPEED OUTPUT... CUT COSTS!

with **Campbell** SPECIAL MACHINES



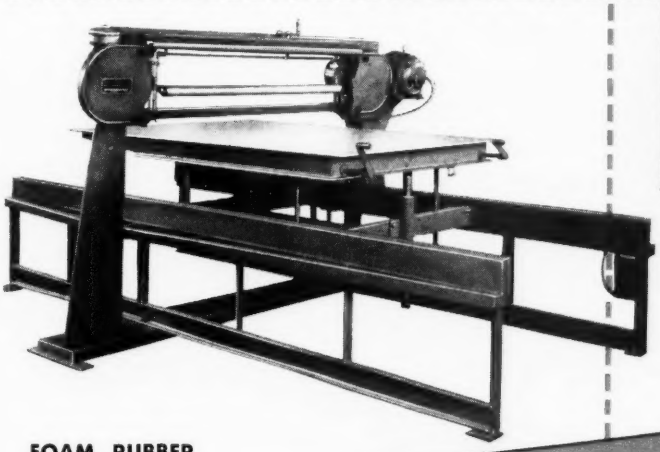
STANDARD AND HEAVY DUTY ROLLER DIE CUTTER

(bed area to 24 sq. ft.)

Die cuts Sponge, Cork, Felt, Rubber, Latex or Bonded Foam, Plastics, etc., *and trims molded rubber.* Standard and Heavy Duty Models.

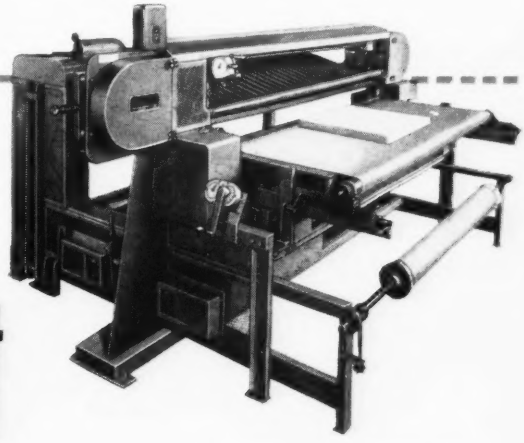
What materials do you want to cut, trim, split or shape? Is it Foam Rubber, synthetic or natural? Is it Plastic? Is it Rubberized Hair, Cork, Cellulose Sponge, Wood Fiber, Latex or Bonded Foam? Campbell Splitters, Die Cutters and Cushion Cutters are setting production records in splitting, die cutting and shaping materials like these and others.

Call or write us for facts and quotations. Send us your particular stock for test cutting without obligation.



FOAM RUBBER CUSHION CUTTER

The Cushion Cutter is ideal for fabricating cushioning and seating materials, also for leveling materials including plastics before splitting.



FOAM RUBBER SPLITTER

Engineered especially to split synthetics, natural foam rubber, plastics, etc. Splits rolls, slabs, sheets to 1/8" thickness, at 9 to 26 feet per minute.

These machines will die cut or split Synthetic and Natural Foam Rubber, Latex and Bonded Foam, Rubberized Hair, Cellulose Sponge, Cork, Resin Bonded Fiber, Wood Fiber, Fiberglass and similar stock in rolls, slabs and sheets.

The FALLS ENGINEERING AND MACHINE CO.

Established 1917

1734 FRONT ST., CUYAHOGA FALLS, O.

News from Abroad

Germany

Skid Resistance, Carbon Black Silica Treads Studied

Recent development work on tires at the Rubber & Plastics Division of Farbenfabriken Bayer, A.G., Leverkusen, included the problems of improving skid resistance, the effect of mixing temperatures on tread compounds, the use of non-carbon fillers in the treads, and abrasion resistance.

A report by G. Fromandi and K. Oettner on some tire tests conducted last year on the Nurburgring (track) to find answers to these problems was recently published.[1]

Porous Treads

Considering that the development of suitable little "suction caps" in the tread is a useful way of preventing skidding on wet or dry streets, the researchers sought for this (after various other experiments) by using blowing agent Porofor BSH Paste and regulating mixing and curing conditions to obtain individual, separate, fairly large pores with thick walls, in the surface and interior of the tread. At the same time the carbon black content was increased to 60% to insure adequate abrasion resistance.

In track tests such treads showed practically the same wear resistance as normal treads, and they gave distinctly better results than the normal tires in skid tests on a wet street. It is realized that abrasion resistance might be less satisfactory in actual use, but the high skid resistance permits the replacement of a finely detailed tread design by a bold one, which again would improve wear resistance.

Effect of Milling Temperatures

No appreciable differences were noted in the mechanical properties of tread compounds milled at different temperatures either in the case of synthetic or natural rubber treads; however, the corresponding curves did indicate that abrasion was somewhat more favorable for the higher milling temperature, and it is considered that under certain conditions—change in the type of carbon black used, for instance—the difference will be more marked. Further reports on this question are forthcoming.

Tread Compounds Containing Light Reinforcing Agents

For these tests, three types of compounds were prepared: A, containing carbon black only; B, containing carbon black and silicic acid filler; and C, with silicic acid filler only, as below:

	A	B	C
Smoked sheets, Defo plasticity 1,000	100	100	100
Carbon Black CK3	45	—	30
Precipitated filler	—	50	20
Active ZnO	3	3	3
Pine tar	2.5	—	1
Stearic acid	3	2.5	3
Paraffin	0.6	0.6	0.6
Antiager PAN	0.75	0.75	0.75
4010	0.75	1.25	1.25
Vulkacit DM	—	0.8	0.8
CZ	0.6	—	—
DOTG	—	0.25	—
Filler activator (amine type)	—	1	0.5
Sulfur	2.5	3	3

Both A and B showed better abrasion resistance than C; in laboratory tests results for B were close to the level for A. In fatigue tests, too, C was inferior to both A and B. Tensile strength was about the same for all three types, but B and C had lower modulus, higher elasticity, and lower damping values.

The investigation on mixtures of carbon black and silicic fillers will be continued.

The carbon black CK3 in the above formula, is a German product that seems to be classifiable between MPC and HAF grades; its particle size appears to lie between that of HAF and SAF grades.

Perbunan Treads

The present easier-to-process Perbunans led to the undertaking of new tests with tires in which the body was of natural rubber, the undertreads and sidewalls, of a mixture of Buna S and Perbunan (1:1), and the top of the tread, 100% Perbunan. The Perbunan compound had a Defo plasticity of 1,750 and extruded perfectly. The individual parts of the tread were produced with the aid of solutions of the respective compounds in methylethyl ketone (1:3) with the addition of 3% colophony. In building up the tread, a 3% colophony solution in methylethyl ketone was used. It is added, that a polymerizate is now being developed which bonds very well with both natural rubber and Perbunan, so that it will be possible to dispense with the above aids.

Test data revealed that the relatively low level of elasticity of the Perbunan vulcanizates improves considerably at higher temperatures, as do the damping values.

Abrasion tests in the laboratory clearly showed the superiority of Perbunan over natural rubber at load of one kilogram, but there was a relatively steep rise in wear with increased load. In tests in the Nurburgring (on a dry track), the Perbunan treads gave substantially better results than the customary natural rubber treads and also shamed superior skid properties.

Further tests are to be undertaken, especially on fatigue resistance.

[1] *Kautschuk u. Gummi*, Oct., 1954, p. 212 WT.

Malaya

Prices, Production, and Problems

The United States has come in for much sharp criticism because of the G.S.A. announcement on the change in stockpiling policy, which all hands agree was the chief factor responsible for the sudden upset of the rubber market.

Considering the situation editorially, the *Straits Times* examines the American reply to the accusation of deliberate depression of prices and breach of faith: namely, that other countries and trade and industry had been consulted and that the I.R.S.G. had also been informed in advance. If the I.R.S.G., the "other countries," and the Malayan Government supported the view of the Americans, then Washington and the G.S.A. should not be blamed for acting on bad advice, said the paper, but the question is, "was Washington given wrong advice, or did it disregard anything which did not come from American trade sources?"

Dangers of High Prices

Not many days before the market began its spectacular drop, G. M. Knocker, managing director of Harrisons & Crosfield, in discussing the stimulus offered by high natural rubber prices to the consumption and production of synthetic rubber, not only in America but, also in Europe, was telling his hearers that no rubber producer should consider dollar- (Straits, naturally) a-pound rubber a good thing. He recalled that it had been calculated that price decided the choice of synthetic or natural rubber for 31% of American rubber consumption; he further warned that to enable natural rubber to be fully competitive, its price would have to be 35 cents (Straits) lower than the prevailing level. To meet this price the natural rubber industry must increase yields by replanting and find more uses for rubber.

The Mudie Mission had recommended ways and means for replanting, but neither government nor industry had yet taken any steps along the suggested lines; apparently the high price level had brought with it a false sense of security leading to dangerous delay in taking needed action.

What to many a European estate manager must have been a disturbing outcome of the high prices was learned from another source; it seems that especially on the more outlying European estates, labor was being lured away to Asiatic plantations and smallholdings by offers of wages substantially above the level fixed by the M.P.I.E.A. and the rubber union, with a consequent shortage of tappers on the European estates involved. The Asiatic estate owners and the smallholders do not belong to the M.P.I.E.A. and naturally do

Take raw neoprene

... extend with SUNDEX-53

... add fillers

... plus curing agents

... and you can make all sorts of low cost neoprene products.

SUNDEX-53 HELPS MAKE POSSIBLE LOW COST EXTENDED NEOPRENES

If you would like to market oil-resistant neoprenes even in the face of strong price competition, consider this fact: Highly extended Neoprene WHV with SUNDEX-53 can be made for prices comparable with those of non-oil-resistant elastomers.

SUNDEX-53 is a low cost petroleum base oil which is highly compatible with neoprene in extended compounds. Used with Neoprene WHV stocks containing high loadings of fillers, SUNDEX-53 conditions these compounds to permit easy handling during processing. The resulting compounds extrude and calender easily and hold their shape through processing operations. Now, neoprene compounds extended with SUNDEX-53 can be used in the manufacture of automobile radiator hose, heater hose, windshield seals, sponge cushions, industrial air hose, washing machine hose, sheet packing, gaskets, grommets, and many other molded goods where cost is a strong factor, and where degradation by oil, grease, ozone, heat, and sunlight cannot be tolerated.

Get complete information on SUNDEX-53 from your Sun Oil representative. Or write Dept. RW-4.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline

not consider themselves bound by the wage agreements, so that they may be expected to be as ready to respond to a sagging market by depressing wages below the fixed rates, as they were to go above them when prices soared, and then labor will start the return movement to the European estates.

Replanting—and a Suggestion

The replanting target for smallholders in 1955 is 60,000 acres—applications for this acreage have already been received, but more are required to make up for that proportion of smallholders—put at 20%—who inevitably will fail to replant.

Early this year a tree-killing composition, 245T Compound, was introduced among smallholders, by means of which old trees can be killed with a minimum of time and effort. A smallholder can paint an acre of trees in four hours, instead of having to spend 60 days of hard work with the axe. The yield of the trees doubles after treatment with the compound, until they rot and fall.

Out of the total area of some 3,500,000 acres under rubber in Malaya, smallholdings cover about 1,500,000 acres, and account for about 40% of output. The number of people directly dependent for a living on these smallholdings is put at 750,000, with many more, including rural traders and transport workers, indirectly dependent.

The suggestion comes from the *Manchester Guardian*. This well-known British paper, in a recent discussion of the natural rubber situation, advocated new planting, instead of replanting, as the more economical method of increasing Malayan rubber output. It points to the large, unexploited acreages of land on the East Coast and in Central Malaya, representing almost 75% of the Federation area, as the logical site for new plantings. One of the advantages of new planting over replanting, of course, would be that rubber growers would not lose income from the old rubber while working on the new areas and waiting for them to mature. The unexploited lands are at present inaccessible, and opening them up would be a long-term and expensive undertaking. Under present conditions in East Asia, however, one can think of more than one reason why clearing even a part of these sparsely inhabited, wild lands might be a wise proceeding.

"More Rubber for Less Work"

If rubber is to overcome an important handicap in the competition with synthetic rubber—that is, cost of production and specifically cost of tapping—new blood, so to speak, must be introduced to insure further increase in yields, to protect improved strains against disease, and to counteract the tendency to loss of vigor noted in inbred lines of selected rubber. The foregoing is the gist of an editorial in the *Planters' Bulletin* for January, 1955, entitled "More Rubber for Less Work."

After the measures taken in the past to improve rubber trees are reviewed, the direction which further progress must take is indicated, and some of the work so far done toward this end is mentioned.

Importations into Malaya have been made from areas where the yield of the wild rubber trees is reputedly twice that of the Wickham trees which form the basis of Malayan plantings. It is hoped that the new importations will not only help raise yields, but will also contribute to increasing the vigor of high-yielding trees. An experiment is now under way to see what results are obtainable.

Considerations of the possibility of the introduction of the dreaded South American leaf disease into Malaya have led to an exchange of clones with the Instituto do Norte, Brazil, in which 25 resistant clones were obtained for 25 Malayan clones. Five of the imported clones have been found suitable for top-budding and are available for immediate use if required; all are resistant, but not particularly high-yielding, and can be used for breeding.

Finally, the Rubber Research Institute of Malaya has arranged with the Rubber Research Institute of Ceylon, the AVROS, of Sumatra, the C.P.V. Experiment Stations in Java, and the Institut des Recherches sur le Caoutchouc en Indochine for an exchange of the best and most promising clones, and 20 clones from each of the institutes named have already been established in Malaya; while 20 Malayan clones have been exported to each of the foreign institutes.

These are the investigations the Rubber Research Institute proposes to pursue. It is added that the Mudie Mission had implied in its report that if a proper replanting rate had been kept up even with the less valuable clones of the earlier years, the cost of production of both estates and smallholders would have been considerably reduced; "yet it is obvious that if improved and higher yielding material can be offered for replanting the same effect can be obtained by a smaller replanting."

Indonesia

Smallholders' Output Aided

In a detailed analysis of the qualities and destination of rubber exported by Indonesia in 1952 and 1953[1] F. J. Bruggeman, of Jajasan Penjilidikan dan Pemakaian Karet (formerly INIRO), Bogor, discusses among the rest the position of smallholder rubber in Indonesia. He shows that the output of this class of rubber consists to a large extent of off-grades, unfinished and poorly prepared rubber hitherto for the most part sent to Singapore to be remilled, smoked, graded and finished.

The annual exports of these lower grades fluctuate widely from year to year; in 1952 they represented 38% of total smallholder rubber; the year before the percentage had been 56; on the other hand, exports of better qualities to consuming countries varied not more than about 6% during the years 1950-1953, inclusive. The reason for this difference is the difference in the two main classes of producers among which smallholders may be divided: those who produce a product ready for shipment and whose output is fairly constant regardless of price, and those who make unfinished and inferior grades and whose output depends on the price of rubber and of rice and other foodstuffs. In the case of the latter category if rubber prices rise (or those of foodstuffs decline) smallholders find it profitable to produce rubber themselves or to work in rubber gardens; when the reverse is the case, they go back to their rice fields.

In recent years there has been a shift in the qualities produced by smallholders in favor of #4 and #5 Sheets, and to a smaller extent, of Thin Browns, and away from unsmoked sheet, which has dwindled markedly. The export of slabs, however, after a promising decline (from the Indonesian point of view) in the first half of 1953, recovered in the second half; so the export of this form continued high.

Dr. Bruggeman deplores this condition the more, since the present capacity of remilling factories in Indonesia is far in excess of total production of slabs. South Sumatra alone has 17 remilling establishments with combined monthly capacity of 15,000 tons of finished product; 14 of these are in Palembang, and the other three in the Lampongs. Only five of the 17 establishments were operating in 1953, and at the end of that year they were producing only about 30% of capacity. This situation is ascribed to the fact that slab dealers were able to make considerable profits on exchange rates by selling to Malaya, and it paid them to outbid local remillers in the Indonesian market.

This explanation, incidentally, points up at least part of the reason for the Indonesian Government's decision to ban the export of low grades to Singapore and contradicts what some claim, that local remilling capacity is inadequate to cope with the conversion of the local supply of slab to blankets.

From another source it is learned that the Indonesian Government intends to set up a new smallholders' company in Telok Beton, along the lines of one already operating in Palembang, which buys up slab rubber from the smallholders and sells to the remillers. The latest company is to have a capital of at least 3,000,000 rupiahs (about $270,000, U.S.). It is added that the demand for South Sumatra blankets has grown so much of late that remillers and exporters cannot meet it.

[1] *Bergcultures*, 23, 22, 607 (1954).

Sumatra

Sabotage Increasing

Sabotage in Sumatra is reportedly becoming worse from month to month. Last November, 500 young rubber trees were pulled out and destroyed, and 1,500 palm oil trees destroyed. This January, 8,000 rubber seedlings were destroyed, and 13,000 young rubber trees pulled out. The climax so far came in early February when 25,000 young rubber trees were pulled out and carried away from Belawan Estate, East Sumatra. Most of the rubber estates in East Sumatra are owned by Dutch, British, and Belgian companies.

IF you're looking for an economical vinyl plasticizer for formulations that require very low volatility and good permanence, order Pittsburgh PX-120 (DiIso Decyl Phthalate). Vinyl products made with this latest addition to Pittsburgh's broad family of phthalate plasticizers are characterized by long life, a high degree of resistance to extraction by various materials and good low temperature properties. And the low specific gravity of Pittsburgh DIDP may enable you to make appreciable savings in your formulating costs.

This favorable combination of properties makes Pittsburgh PX-120 especially suitable for manufacturing sheeting, flooring, coated fabrics, vinyl sponge, and extruded products such as refrigerator gaskets, shoe welting and electrical jacketing.

We'll gladly send you specifications and other technical information about Pittsburgh DIDP. *Write today for Bulletin 120.*

PITTSBURGH *Job-Rated* PLASTICIZERS

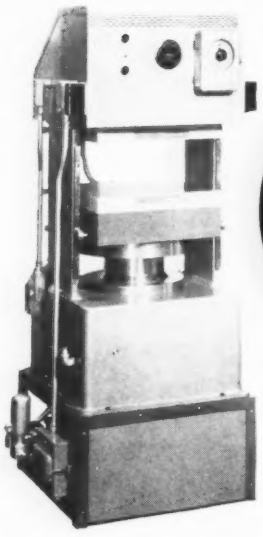
PX-104 DiButyl Phthalate	PX-209 DiNonyl Adipate
PX-108 DilsoOctyl Phthalate	PX-220 Dilso Decyl Adipate
PX-114 Decyl Butyl Phthalate	PX-238 DiOctyl Adipate
PX-118 IsoOctyl Decyl Phthalate	PX-404 DiButyl Sebacate
PP-120 Dilso Decyl Phthalate	PX-438 DiOctyl Sebacate
PX-138 DiOctyl Phthalate	PX-800 Epoxy
PX-208 DilsoOctyl Adipate	PX-917 TriCresyl Phosphate

PLASTICIZER DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

W&D 5569

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

The **P·H·I** *Automatic 70 Ton Hydraulic Press*



ELECTRIC
Hydraulic System, Cycle Timer, Heated Platens and Temperature controls

18"x18" Platens to 600° with thermoswitch controls.
Two position ram gives 8"& 12" Daylight.
8" stroke with down stroke trip.

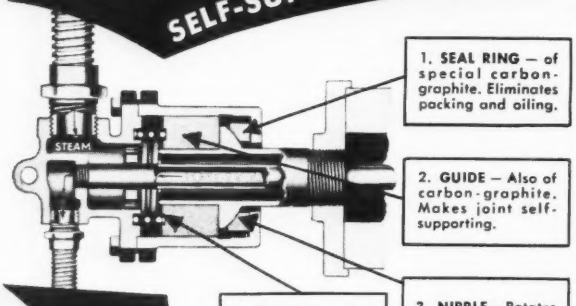
larger presses built to customers specifications

P·H·I

Write for Circular
PASADENA HYDRAULICS INC.
279 N. Hill Avenue
Pasadena 4, California

PRESS

JOHNSON Rotary Pressure JOINT
SELF-SUPPORTING TYPE


STEAM
1. SEAL RING — of special carbon-graphite. Eliminates packing and oiling.
2. GUIDE — Also of carbon-graphite. Makes joint self-supporting.
3. NIPPLE — Rotates with roll, seals against ring.
4. SPRING — For initial seating only. In operation joint is pressure sealed.

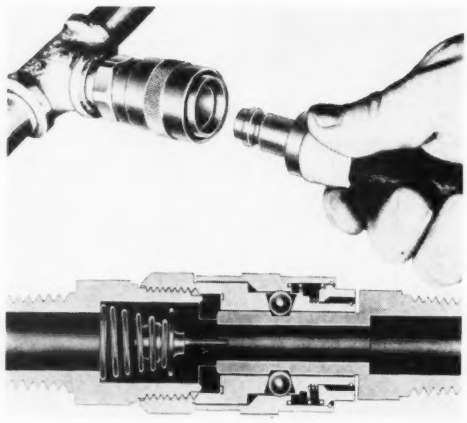
Only 4 Internal Parts

For introducing steam and liquids into rotating rolls and cylinders, there's nothing like the Johnson Joint above. It's packless, self-lubricating, self-adjusting, self-supporting. It has been adopted by dozens of machinery makers, and is finding new uses every day.

Type SB shown handles both steam and condensate through same head; also available for through flow service, and in sizes and styles for all operating conditions. ***Write for literature.***

The Johnson Corporation
869 Wood St., Three Rivers, Mich.

NEW EQUIPMENT



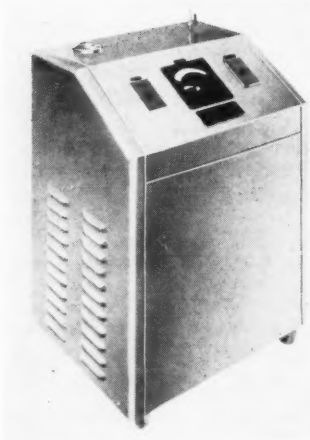
Breco Pushomatic hose coupling

Automatically Locking Hose Couplings

A complete line of automatically locking couplings for air, hydraulic, and fluid-handling hose has been introduced by Breco Mfg. Co., Inc., Baltimore, Md., division of Perfecting Service Co., Charlotte, N. C. Called Pushomatic, the line features simple push-in operation for connecting or disconnecting without turning or twisting, and makes high-pressure leakproof connections.

An integral check valve automatically shuts off the line when the coupling is disconnected, preventing backlashing or whipping. Full 360-degree swivel action, small diameters, and application up to 10,000 psi. are other reported features. Manufactured in a variety of styles and types of couplings and connecting plugs, the Pushomatic line comes in ⅛- to ¾-inch sizes.

Portable Liquid Cooler



Liquid Cooler Model L-1

A portable liquid cooler that provides liquid cooling in an operating range of from +60° F. to –20° F., with control within ¾° F., has been placed on the market by Mayer Refrigerating Engineers, Inc., Lincoln Park, N. J. Designated Model L-1, the unit is said to be designed for simple and fast operations, run hose from cooler to apparatus, plug electric cord in wall socket, set thermostat and start, and to require no auxiliary control equipment or skilled personnel.

Components of the cooler include a ¾-hp. Freon compressor, an air cooled condenser, a 40-120 gph. brine pump, a four-gallon brine tank, and a precision indicating-type thermostat. Overall dimensions are 28 by 22 by 34 inches, and shipping weight is about 250 pounds.

A BANBURY INTERCHANGE

BY SECO
ESTABLISHED 1868

SAVES YOU WEEKS OF *COSTLY DOWN TIME*

Ready for Shipment

TIME IS MONEY

PARTS FOR ALL SIZE MIXERS IN STOCK

A SECO ESTABLISHED 1868 rebuilt Banbury body, now available on our Guaranteed Interchange Plan, saves you money two ways—

- *Reduces to a minimum lost production through mixer down time.*
- *Restores operating efficiency to new-equipment level.*

Both of these factors represent time, and *time is money*.

SECO engineered rebuilding of Banbury bodies by skilled technicians, combined with material and construction improvements, assures you of top operating efficiency and dependability—backed by the guarantee of manufacturers of high-precision machinery since 1868.

Your letter, wire or telephone call will bring one of our Engineers to your plant—without cost or obligation—to give you the details of our Guaranteed Interchange Plan.

SKINNER · ENGINE · COMPANY

SECO ESTABLISHED 1868

RUBBER MACHINERY DIVISION
TELEPHONE ERIE 2-3661

ERIE 6 · PENNSYLVANIA

AMES

No. 2 Dial Comparator

This is smallest in the Ames' line of high quality dial comparators. It is ideal for desk or bench use in the fine inspection of small precision parts. Light in weight, its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a 0-100 dial, graduated in .001", with a .250" range. If your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for details.

Ames Long Range Dial Indicator No. 2822

Ames Dial Comparator No. 150

Ames Caliper Gauge No. 12B

Ames Dial Micrometer No. 510

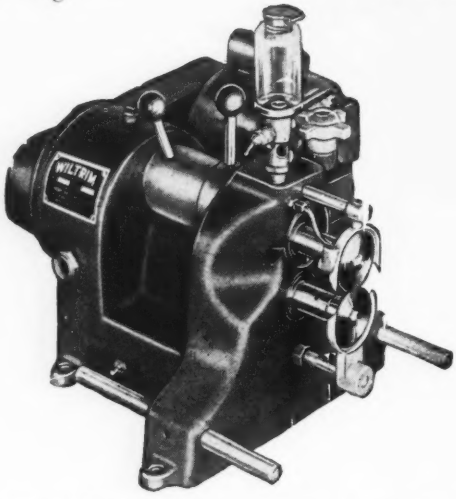
Send today for your free copy of Catalog No. 58

Representatives in principal cities. B. C. AMES CO. *59 Ames Street, Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

WILTRIM®

Model DF TRIMMER



Wills thirty-eight years experience brings you this outstanding successor to the famous earlier Models D, DE, and DM trimmers.

MACHINES ARE AVAILABLE FOR TRIAL

FERRY MACHINE COMPANY

WILLS RUBBER TRIMMING DIVISION

KENT, OHIO, U.S.A.

(Export Sales Through Binney & Smith, International)

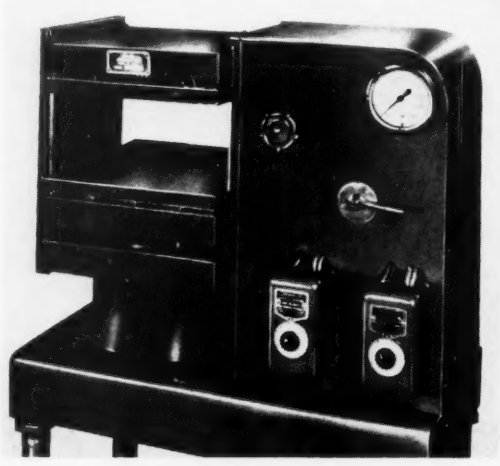
Low-Price Indicating Controller

Foxboro Model 41A Controller

An indicating controller in the low-price range for use on simple industrial processes has been introduced by Foxboro Co., Foxboro, Mass. Designated Model 41A Pneumatic Controller, it is said to provide sharp on-off or narrow band proportional control of such variables as temperature, pressure, liquid level, and humidity.

Handling any process with large capacity-demand ratio and negligible lag, the controller, when equipped for on-off action, snaps the control valve from fully opened to fully closed when the measurement crosses the control point. For a process requiring throttling action, the instrument is equipped with a proportional unit adjustable from ¼% to 25% of scale. The unit, a simplified blast feedback proportioning mechanism, relies on air-jet rather than bellows-actuated follow-up action.

Designed to replace the firm's earlier Model 41, the internal components of the unit have been rearranged to simplify routine instrument maintenance. Case size is 11¼ by 9 by 4¾ inches.



Model 60-12 Atlas Hydraulic Press

Compact Hydraulic Molding Press

A compact hydraulic press for precision molding of rubber and plastics, and for other laboratory and production uses where controlled heat and pressure are required, has been introduced by Atlas Hydraulics, Inc., Philadelphia, Pa. Called Model 60-12, the press has simple individual controls that can regulate hydraulic pressure for each operation to within a 50-4,000 psi. range, or a total possible hydraulic pressure of 60 tons.

Model 60-12 is manufactured with a choice of electrically heated 12- or 14-square-inch platens. A specially designed cooling system reduces platen transfer heat on the ram, ram pot, hydraulic oil, and packing, the company reports. This reduction of heat prevents acceleration of chemical changes in the oil and maintains its viscosity and acidity, doing away with deposition of gums and varnishes on highly polished surfaces.

Power source of the unit is an air hydraulic boost pump said to maintain accurate and consistent pressure on the platen area. For fast platen closure, air is entered into an oil reservoir to raise the ram; high pressure is achieved by the air driving a large surface piston which in turn motivates a small oil piston.

Compressing 200,000 square feet into 60

You're looking at a giant titanium plant in miniature—as set up in the Glidden Laboratories in Baltimore. It is a small-scale "plant" that transforms jet black titanium ore into gleaming white pigment. This hydrolysis process provides an accurate check on every shipment of titanium ore received by Glidden.

It's all part of the vigilant Glidden quality control program—established to assure you the finest in pigments of all types—ZOPAQUE Titanium Dioxides; CADMOLITH Reds and Yellows; SUNOLITH Lithopones. Write for detailed specifications today.

THE GLIDDEN COMPANY

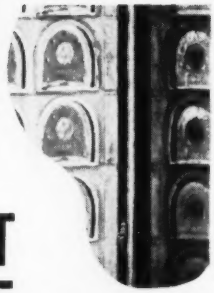
Chemicals • Pigments • Metals Division

Baltimore, Maryland • Collinsville, Illinois • Hammond, Indiana • Oakland, California

CHEMICALS PIGMENTS METALS

QUALITY Glidden PRODUCTS

Rubber Molds Cleaned And Brightened BEST with Oakite RUSTRIPPER!



Iron rubber molds, heavily encrusted with silicone and carbon deposits, presented a difficult cleaning problem at one large plant. The local Oakite Man was consulted. After he had carefully analyzed the problem, he suggested soaking the molds in a solution of Oakite Rustripper for 20 minutes. The results were startling. Not only was every trace of deposit removed—even from the sharp corners and indentations—but the metal molds looked as if they had been hand-polished! For further details about revolutionary Rustripper, write Oakite Products, Inc., 47 Rector St., New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

The term

"COTTON FLOCKS"

does not mean cotton fiber alone

EXPERIENCE

over twenty years catering to rubber manufacturers

CAPACITY

for large production and quick delivery

CONFIDENCE

of the entire rubber industry

KNOWLEDGE

of the industry's needs

QUALITY

acknowledged superior by all users are important and valuable considerations to the consumer.

Write to the country's leading makers for samples and prices.

CLAREMONT WASTE MFG. CO.

CLAREMONT N. H.

The Country's Leading Makers

NEW MATERIALS

Antioxidant 425

A new, non-staining, non-discoloring antioxidant for use in compounding of white and light-colored natural and synthetic rubber goods has been introduced commercially by American Cyanamid Co., Bound Brook, N. J. Called Antioxidant 425, the material, 2,2'-methylene bis (4-ethyl-6-tertiary butyl phenol), is a white crystalline powder with a melting range of 119-125° C. and a specific gravity of 1.10.

According to the company, Antioxidant 425 is effective in ratios as low as 0.25% and gives excellent protection against the effects of oven heat and oxygen bomb aging in ratios of 1-2% on the rubber. White rubber containing 2% of the material showed no evidence of antioxidant bloom after four months of natural aging. A ratio of 0.5-1.5% of the material is recommended for most uses, and in such dosages no accelerator adjustment is required, since the rate of cure is little affected or not at all. Antioxidant 425 shows an excellent balance of antioxidant, non-discoloring, and non-staining properties in white, light-colored, and non-staining rubber compositions, including latex compounds.

A technical booklet on the material, reporting sample recipes and test data, is available from the company.

Fedco Tackifiers

A line of emulsions especially suitable for tackifying and adhesive purposes has been introduced by Federal Latex Corp., Brooklyn, N. Y. Called Fedco Tackifiers, they were developed for modifying natural and synthetic latices for use in adhesive formulations.

The following is reported data on five of the materials, Fedco Tackifiers #11, #66, #40, #26, and #80A:

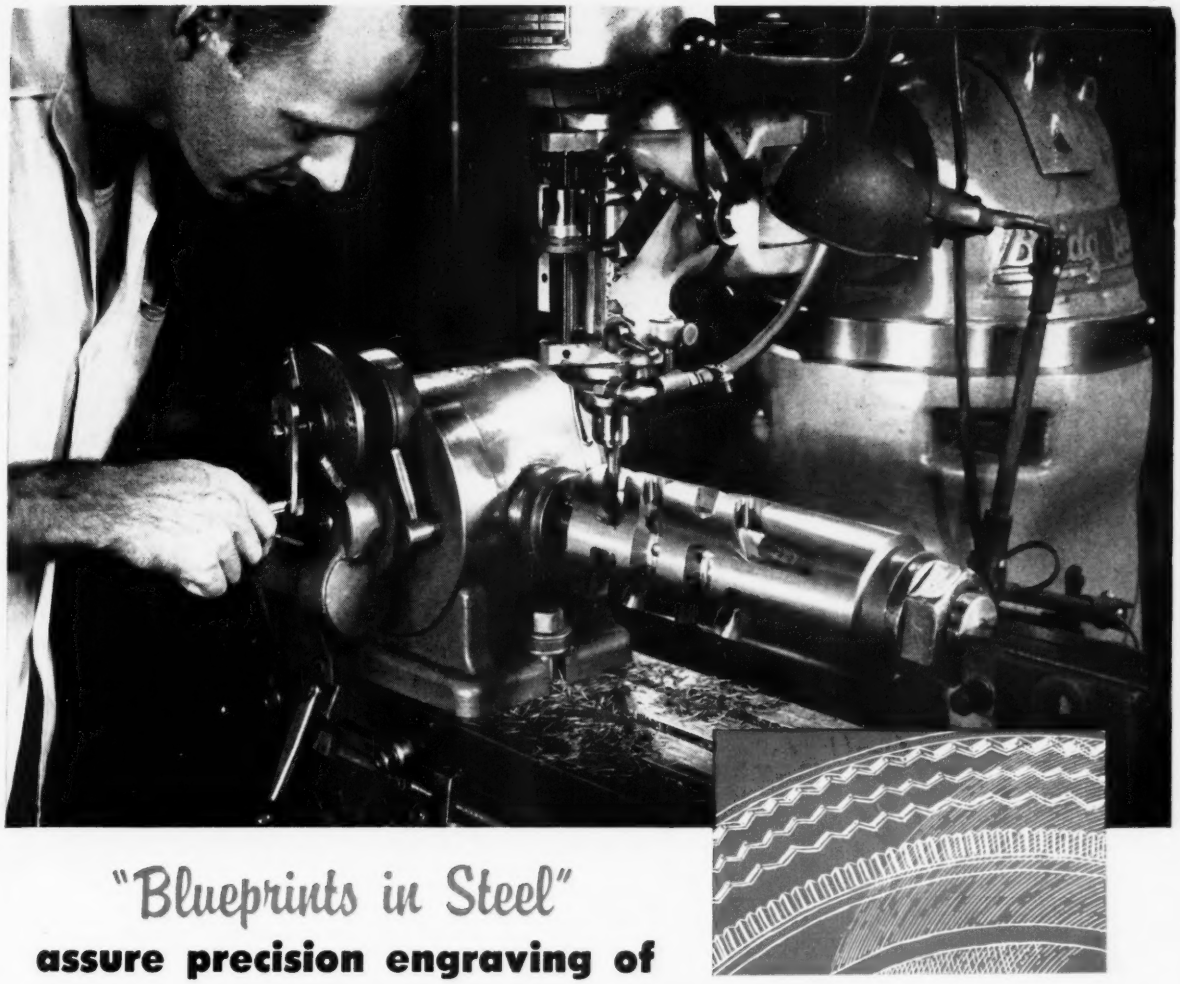
Tackifier	Color	% Solids	Viscosity, Cps.
#11	white	66	14,000
#66	white	48	1,400
#40	tan	49	4,000
#26	brown	64	1,000
#80A	white	62	22,000

Heat-Stable Antiozidant—UOP 88

A new antiozidant[1] said to be particularly effective in preventing cracking in GR-S compositions has been introduced commercially by Universal Oil Products Co., Des Plaines, Ill. Called UOP 88, the material, N,N'-dioctyl-p-phenylene diamine, is a heat-stable, staining red fluid that is expected to find application in tires, military goods, and electrical equipment. Evaluations in other rubbers and rubber compounds are currently under way, although its effectiveness with natural rubber, nitrile rubbers, and oil-extended polymers is deemed probable under higher concentrations of the antiozidant.

With GR-S, concentrations of 2-5 PHR are recommended. UOP 88 is said to be an ozone scavenger rather than a protective coating and is, therefore, effective under dynamic as well as static conditions. Its low vapor pressure enables it to be retained in compositions after heat aging. Other physical data concerning it are as follows: specific gravity @ 60° F., 0.912; average weight per gallon, 7.6 pounds; boiling point, corrected from vacuum distillation data, about 400° C. @ 760 mm.; and it is soluble in most hydrocarbon solvents, but only slightly soluble in water.

[1] RUBBER WORLD, Aug., 1954, p. 636.



"Blueprints in Steel"

assure precision engraving of

BRIDGWATER TIRE MOLDS

Skilled hands and specialized machine tools produce master cams like this one, in the tire mold plant of Bridgwater's Athens Machine Division, Athens, Ohio. These cams are virtually "blueprints" made of steel, since each is an unerring record of minute details in the design of an automotive tire tread. When completed, the cam will become the "brain" which enables a Bridgwater Engraving Machine to reproduce in a tire mold, a tread design *precisely* as it was originally planned.

Master cams, and the Bridgwater designed and built Engraving Machines they control, are typical examples of *many* precise methods and machines used at Athens to speed manufacture of finest quality precision molds, and yet keep the cost of these molds at lowest possible levels.

At Bridgwater's Athens Machine Division, skilled craftsmen and specialized machine tools have but *one* obligation . . . to produce fine molds of any type or size, in engraved steel, cast iron or aluminum, on a basis which most favorably meets the tire industry's requirements for *faster* production of higher quality molds, at lower cost.

1903

ATHENS MACHINE DIVISION

BRIDGWATER MACHINE COMPANY

Akron, Ohio

Now . . . Up-To-The-Minute

INTERNATIONAL TECHNICAL ASSISTANCE

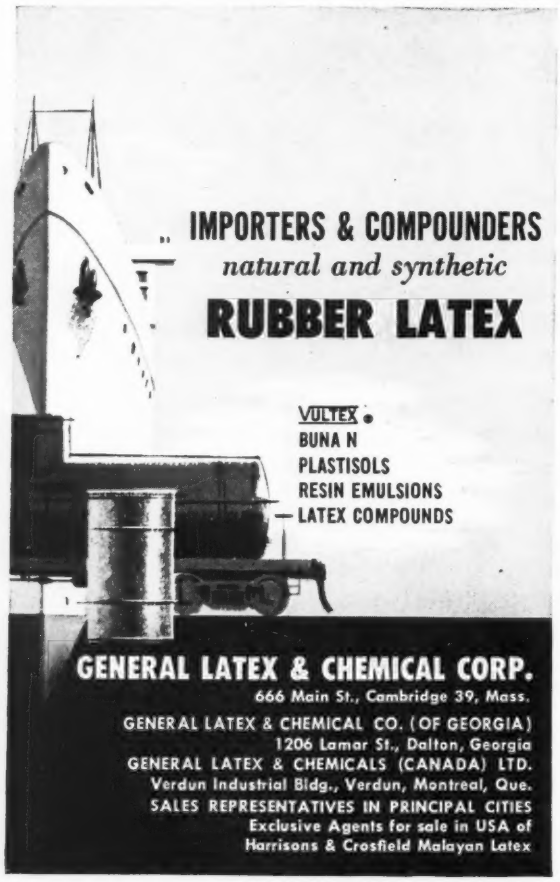
- To tire and other rubber manufacturers abroad who desire to learn the latest American "Know-How" . . . cut manufacturing costs — we offer comprehensive Technical Assistance at low cost.
- Dayton Rubber's I.T.A. plan has been in existence for 20 years. Rubber experts and teachers who give unexcelled technical assistance at a surprisingly nominal cost . . . all backed by 50 years of recognized leadership in the rubber industry . . . with 4 U. S. plants.
- We train your personnel in these modern plants . . . help you establish the latest formulae for processing natural and all new types of synthetic rubbers and textiles . . . latest "Know-How" in Tubeless Tires, Butyl Tubes, Rayon and Nylon Cords, Carbon Blacks. We also design factories and supervise machinery installations if desired. Write: International Technical Assistance Division, Dayton Rubber Co., Dayton 1, Ohio.

CABLE ADDRESS: THOROBRED

INTERNATIONAL TECHNICAL ASSISTANCE DIVISION I.T.A. THE DAYTON RUBBER CO DAYTON, OHIO

GOLDEN JUBILEE

Dayton Rubber 50 YEARS OF PROGRESS



IMPORTERS & COMPOUNDERS
natural and synthetic
RUBBER LATEX

VULTEX •
BUNA N
PLASTISOLS
RESIN EMULSIONS
— LATEX COMPOUNDS

GENERAL LATEX & CHEMICAL CORP.
666 Main St., Cambridge 39, Mass.
GENERAL LATEX & CHEMICAL CO. (OF GEORGIA)
1206 Lamar St., Dalton, Georgia
GENERAL LATEX & CHEMICALS (CANADA) LTD.
Verdun Industrial Bldg., Verdun, Montreal, Que.
SALES REPRESENTATIVES IN PRINCIPAL CITIES
Exclusive Agents for sale in USA of
Harrisons & Crosfield Malayan Latex

Pennsalt Neoprene Lining Compound

A neoprene lining compound that flows on like paint to a variety of industrial surfaces has been placed on the market by Pennsylvania Salt Mfg. Co., Philadelphia, Pa. Called Pennsalt NeoLine, the material can be cured by heat or air and is resistant at temperatures up to 200° F. to the corrosive action of strong alkalies, brine, acids, vegetable oils and greases, and a variety of other chemical substances.

The compound may be applied to metal, concrete, or wood and is recommended for such equipment as fan blades, fume ducts, process vessels, pump impellers, valves, and piping. Curing accelerators are packaged separately and added to the NeoLine prior to application. Equipment may be surfaced by brush, roller, spray, or dip methods.

Vacuum Sealing N Rubber—366YV

A new rubber compound for sealing such high vacuum applications as electronic devices, lens coating machinery, evaporators, high vacuum distillation equipment, electron microscopes, and special testing devices has been announced by Minnesota Rubber & Gasket Co., Minneapolis, Minn. Called 366YV, the compound is a formula of nitrile type polymer which can be injection-molded into special shapes and standard sizes of Quad-rings and O-rings. This material is said to have a high resistance to outgassing at elevated temperatures, and it maintains long service life in permanent installations.

Literature on 366YV may be obtained by writing Department KP of the firm, 3630 Wooddale Ave., Minneapolis 16.

Vulcanizing Agent—VA-7

A liquid aliphatic polysulfide vulcanizing agent for unsaturated natural and synthetic elastomers has been introduced by Thiokol Chemical Corp., Trenton, N. J. Called VA-7, the material contains combined sulfur available for vulcanization and is said to impart to rubbers a combination of heat-aging properties, high tensile strengths at low concentrations, and non-blooming characteristics in the cured or uncured state. VA-7 is easily and uniformly dispersed, Thiokol reports.

Technical Service Bulletin No. 119, giving typical recipes for VA-7 in GR-S and acrylonitrile rubbers, is available from the company.

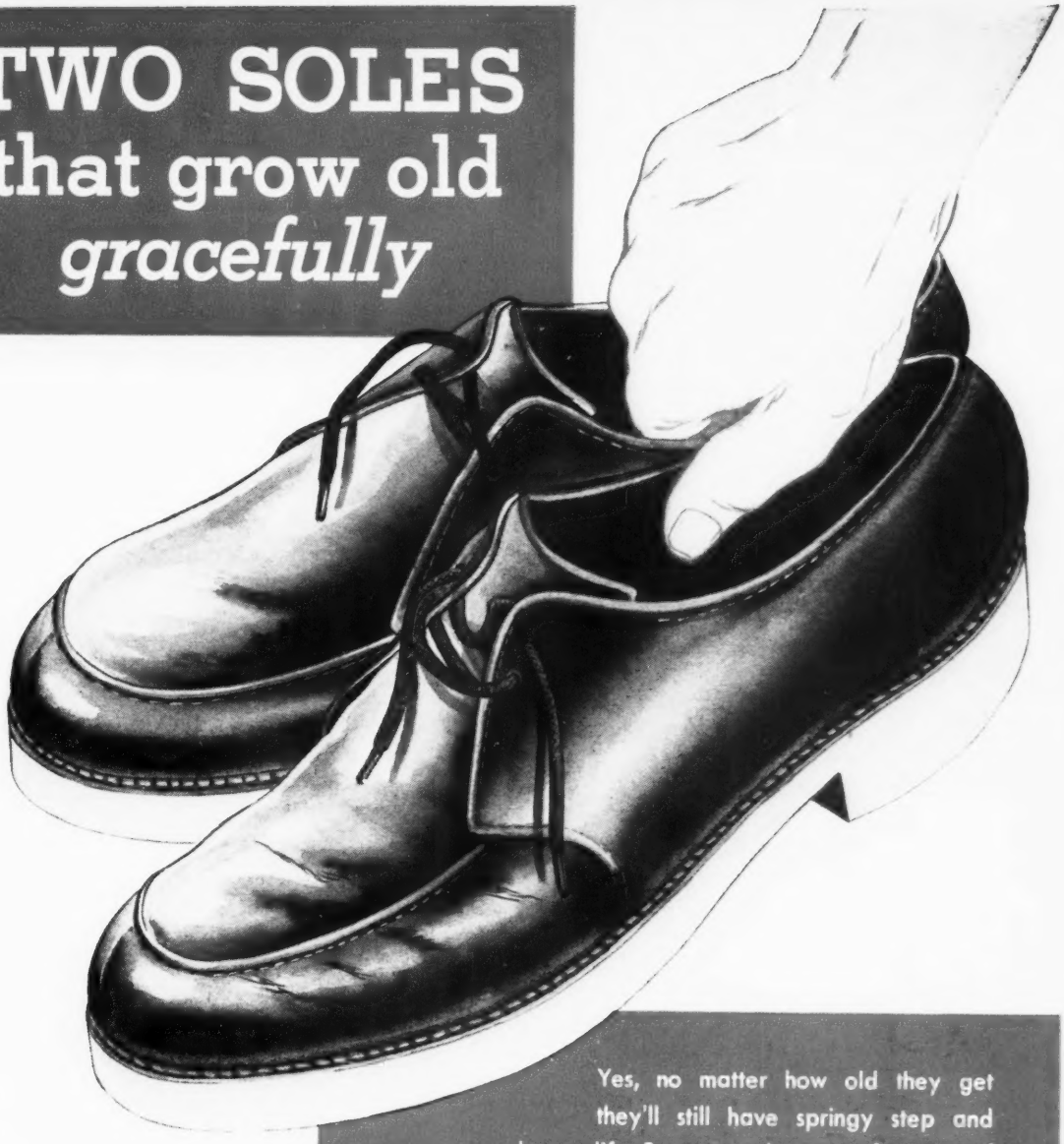
Polyethylene Glycol in 15,000-20,000 M.W. Range

Carbowax polethylene glycol 20M with an estimated molecular weight of 15,000 to 20,000 has been put on the market by Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y. Available in carload quantities, the material is the tenth member of the company's series of Carbowax polyethylene glycols and gives the series a molecular weight range of 200-20,000.

A water-soluble white solid with the binding, suspending, and lubricating properties typical of the polyethylene glycol compounds, Carbowax 20M has a melt viscosity and aqueous solution viscosity considerably higher than those of the firm's Carbowax 6000, said to be the highest molecular weight compound heretofore available. Carbowax 20M forms films stronger and harder than those of other solid polyethylene glycols, the company further reports.

Because its solution viscosity is about twice that of equivalent gum arabic solutions, Carbowax 20M is suggested for use in colored pigment suspensions, aqueous based inks, and other preparations where mild thickening action combined with suspending power is desired. Other recommended applications include its utilization as a release agent for rubber where intricate molds require a viscous lubricant; as a water-soluble binder in paper and textile starch sizes; and as a binder for ceramics, carbon products, and synthetic detergent cakes.

TWO SOLES that grow old *gracefully*



Yes, no matter how old they get they'll still have springy step and longer life. Because today, manufacturers of quality footwear use Neville Resins in compounding synthetic soles and heels, thus improving the properties of their product. They get abrasion resistance, flex-life, high tensile strength and uniform quality in the stock they use.

● *These advantages are obtainable with Neville Resins in processing other rubber products too, such as molded goods, mats, floor tile, wire insulation and mechanical goods in general!*

NEVILLE CHEMICAL CO.

PITTSBURGH 25, PA.

Plants at Neville Island, Pa. and Anaheim, Cal.

NEVILLE
RESINS

Call us for samples and information

R-54

DO YOU MAKE...

Industrial Rubber Parts?
Insulated Wire?
Shoe Soles?
Tile?

Buy your Neoprene Grade magnesia from a SPECIALIST!

General Magnesite

will serve you with the widest range of quality magnesias:

GENMAG TECHNICAL EXTRA LIGHT CALCINED MAGNESIA — for excellent scorch resistance, high tensile and fast cures.

GENMAG ML TECHNICAL LIGHT 101 — Two good low-cost magnesia values

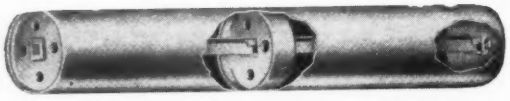
HEAVY CALCINED MAGNESITE— for Filler, Corrective and Extender

CARBONATE OF MAGNESIA, LIGHT— fine and pure

GENERAL MAGNESITE AND MAGNESIA COMPANY

Manufactured at: Plymouth Meeting, Penn., *Phone:* Plymouth Meeting 3-2880, *Mailing Address:* Box 671, Norristown, Penn.

STEEL CALENDER STOCK SHELLS



ALL STEEL, ALL WELDED CONSTRUCTION, with forged steel hubs for 1¼", 1½" and 2" square bars. 4", 5", 6", 8", 10", 12", 15", 20" and 24" diameters. Any length. Also Special Trucks (Leaf Type) Racks, Tables and Jigs.

Used in manufacturing rubber and plastic products.

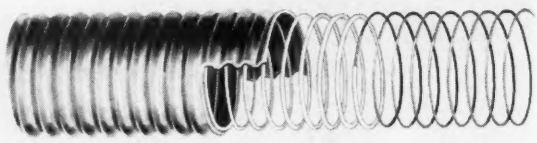
THE W. F. GAMMETER COMPANY
CADIZ, OHIO

THE NAME TO REMEMBER FOR PRECISION

McNEIL AKRON

Manufacturers of the World's Finest Rubber Curing Equipment

NEW PRODUCTS



Dayflex Vacuum Hose

Vacuum Cleaner Hose with Wire Core

A vacuum cleaner hose constructed with a tempered spiral wire core, said to afford maximum flexibility and strength, has been introduced by The Dayton Rubber Co., Dayton, O. Called Dayflex, the synthetic rubber hose has a plastic-like appearance and feel, according to the company, and a polished interior surface that will not retain dirt or dust. The wire core will not permit the hose to curl or twist. Lighter weight is also claimed for the new product.

Recording Chart Paper

Circular and strip chart paper said to improve the legibility of instrument records has been put on the market by Foxboro Co., Foxboro, Mass. Called Humitex, the paper is printed under controlled humidity conditions on white sulfite sheet, with special sizing agents added to permit sharp recording without feathering, according to the company.

Scale markings and time arcs are printed in a neutral gray for contrast with colored recording inks. Circular charts are printed and center-punched in the same operation, holding eccentricity tolerance of less than 0.002-inch between hub hole and scale circles. Printing plates are produced to tolerances of 0.00025-inch.

Yellow-Covered Water Hose

A yellow-covered water hose designed primarily for underground service has been introduced by Boston Woven Hose & Rubber Co., Cambridge, Mass. Called Golden Vim, the hose has a natural rubber cover, cotton yarn braided reinforcement, and a tube blended of GR-S and natural rubbers. Purpose of the yellow cover, according to the company, is to increase the visibility of the hose underground, lessening its hazard to workmen, as well as preventing accidental damage to itself. The hose is available in ¾- and one-inch sizes.

Ribbed Rubber Shelving

Molded rubber shelving with ribbed surface design to prevent slippage of glassware and to increase speed of drying has been introduced by The Wooster Rubber Co., Wooster, O. Called Rubbermaid Shelving, it is made of semi-soft standard stock rubber, in green or blue-grey colors, and in sizes of 11¾ inch-width for 60-foot rolls and 22-inch width for 30-foot rolls. The shelving is resistant to hot water, detergents, and grease, can be trimmed easily, and will not curl, it is claimed. It is intended for use in hospitals, restaurants, fountains, and bars.

W. E. Shively, Goodyear's manager of tire design, displays firm's LifeGuard blowout shield

Protective Tube for Tubeless Tires

An inner shield of nylon fabric to insure against blowouts of tubeless tires has been introduced by The Goodyear Tire & Rubber Co., Akron, O. Called LifeGuard Shield, the tubelike diaphragm forms an inner air chamber by sealing itself against the rim and tire beads, with wings extending from the shield under the beads holding it securely in place.

According to the company, on inflation of the tire the air enters through the valve in the rim, inflating the shield and passing through a metal grommet in the shield to inflate the outer chamber of the tire. If a blowout should occur, the air in the outer chamber will escape immediately; while that in the inner tube will leak very slowly, restricted by the grommet. This circumstance gives the driver adequate time to bring the car to a safe stop.

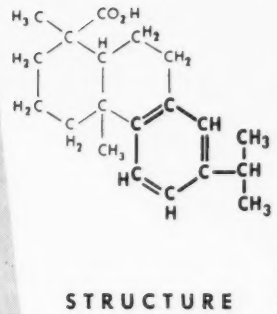
No tubeless tire offers absolute protection against blowouts or immunity to injury from large, sharp objects, Goodyear says, and the LifeGuard Shield was developed to achieve maximum possible protection. Available in sizes 6.40/6.70 x 15, 7.10/7.60 x 15, and 8.00/8.20 x 15, it can be used with most tubeless passenger tires. Proper installation is assured by the mounting guards on the shield which are visible above the edge of the tire rim and indicate when the shield is locked in the proper position.

Durite Sparkproof Flooring

Durite, a sparkproof flooring designed for use in hospital operating rooms, laboratories, and munition plants and storage centers, has been announced by the mechanical goods division of United States Rubber Co., Rockefeller Center, New York 20, N. Y. Composed of conductive synthetic rubber and fabric, the flooring reportedly dissipates static electricity which might otherwise ignite highly inflammable gases such as ether and cause an explosion.

The absence of wires in the product makes grounding unnecessary, and equipment may be rolled in safety over it, the company says. The flooring is resistant to blood, sulphur, ether, and other substances encountered in operating rooms, and its resilience provides for working comfort. Durite has been tested and approved by Underwriters' Laboratories, Inc., and meets the safety requirements of the National Fire Protection Association, according to the company.

GALEX®



STRUCTURE

A non-oxidizing tackifier and plasticizer for GR-S, NEOPRENE, NATURAL RUBBER and RECLAIM.

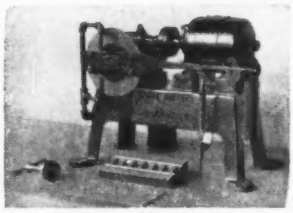
"Galex" is a stable rosin acid that effectively tackifies and plasticizes GR-S, Neoprene, natural rubber and reclaim. Because of its chemical structure, principally dehydroabietic acid, "Galex" is unaffected by oxidative aging and does not induce oxidation of elastomers in which it is used. It is highly compatible with various elastomers, resins and solvents.

"Galex" is widely used as a tackifier-plasticizer in hose, belting, mechanical goods and various friction stocks. It imparts strong surface tack which develops into excellent adhesion after cure. "Galex" also functions as a highly stable and compatible tackifier in rubber-base adhesives and cements.

Write for technical information and samples.

Thiokol® Chemical Corporation
SYNTHETIC RUBBERS • PLASTICIZERS • CHEMICALS • SOLID PROPELLANTS
784 NORTH CLINTON AVE., TRENTON 7, NEW JERSEY
In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario

TESTED IS TRUSTED



DUPONT ABRADER

One of the many *Scott Testers for "World-Standard" testing of rubber, textiles, plastics, paper, wire, plywood, up to 1 ton tensile.

SCOTT TESTERS

SCOTT TESTERS, INC.

90 Blackstone St., Providence, R. I.

*Trademark

THE ALUMINUM FLAKE COMPANY

AKRON 14, OHIO

Manufacturers of

ALUMINUM FLAKE

A COLLOIDAL HYDRATED ALUMINUM SILICATE

REINFORCING AGENT for

SYNTHETIC and NATURAL RUBBER

New England Agents — Warehouse Stocks

H. A. SCHLOSSER & CO.

401 INDUSTRIAL BANK BUILDING

PROVIDENCE 1, RHODE ISLAND

MOLDS

WE SPECIALIZE IN MOLDS FOR

Heels, Soles, Slabs, Mats, Tiling and Mechanical Goods

MANUFACTURED FROM SELECTED HIGH GRADE STEEL BY TRAINED CRAFTSMEN, INSURING ACCURACY AND FINISH TO YOUR SPECIFICATIONS. PROMPT SERVICE.

L. C. WADE CO., INC.

79 BENNETT ST. — LYNN, MASS.

FINELY PULVERIZED, BRILLIANT

COLORS

FOR RUBBER-VINYLS

Western Representative: FRED L. BROOKE CO., P. O. Box 463, Oak Park, Ill.

Ohio Representative: PALMER SUPPLIES CO., 2281 Scranton Road, Cleveland 13, 800 Broadway, Cincinnati 2

Pacific Coast: ERWIN GERHARD, 40 California St., San Francisco 11, Calif.

BROOKLYN COLOR WORKS INC.,

MORGAN & NORMAN AVES., BROOKLYN 22, N.Y.

TECHNICAL BOOKS

BOOK REVIEWS

"Synthetic Rubber." Prepared under the Auspices of the Division of Rubber Chemistry, American Chemical Society. Editorial Board: G. S. Whitby, Editor-in-Chief, C. C. Davis, and R. F. Dunbrook. Thirty-eight contributors. John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London. Cloth, 5¾ by 9 inches, 1044 pages. Price, $18.00.

This is a very welcome book because it covers an enormous amount of research and development on and methods of manufacturing synthetic rubbers. It has 1044 pages and is written by 38 contributors, all of whom have been active in the work. Furthermore the volume was prepared under the auspices of the Division of Rubber Chemistry of the American Chemical Society and therefore is authoritative. The editorial board signifies the excellence of the book.

World War II brought synthetic rubber into high figures in this country. In 1941 the production was chiefly of neoprene and nitrile synthetic rubbers, amounting to only 8,114 long tons, but in 1944 the total production of synthetic rubber was 764,072 long tons, consisting of GR-S, 670,268 long tons; neoprene, 58,102; Butyl, 18,890; and nitrile, 16,812; and in 1945 the total was 820,352 long tons. Importation of natural rubber in 1944 was 138,028 long tons. Until last year the total production of synthetic rubbers in this country was almost twice the imported natural rubber, and in that year GR-S became slightly lower.

The book opens with a 31-page introduction by Dr. Whitby, followed by a 21-page historical review by Dr. Dunbrook. These two chapters give much general information of a wide coverage. There are complete descriptions of the manufacture of butadiene and isoprene from petroleum, of butadiene from alcohol, of styrene, and of GR-S. Much theoretical information appears on the emulsion polymerization systems for the different types of GR-S, the chemical structures of polymers, GR-S latex, physical test methods, wire and cable insulation, studies on other synthetic rubbers, and reclaiming synthetic rubbers. There are many photographs of apparatus and tests, many graphs, and many tables. In fact, it is difficult to name a subject on synthetic rubber that is not found and well discussed in this book.

Ordinarily it is not considered good practice to include in a review the titles and authors of chapters, but in this case it seems best to do so in order to show the contributors and the type of work in the book. 1. Introduction, G. Stafford Whitby. 2. Historical Review, R. F. Dunbrook. 3. Manufacture of Dienes from Petroleum, C. E. Morrell. 4. Manufacture of Butadiene from Alcohol, W. J. Toussaint and J. Lee Marsh. 5. Preparation and Production of Dienes by Other Methods, Harry L. Fisher. 6. Manufacture of Styrene Monomer, J. E. Mitchell and J. Lawrence Amos. 7. The Manufacture of GR-S, John W. Livingston and John T. Cox, Jr. 8. Emulsion Polymerization Systems, C. F. Fryling. 9. Chemical Study of the Structure of Diene Polymers and Copolymers, C. S. Marvel and Henry E. Baumgarten. 10. Physical Chemistry of Synthetic Rubbers, Lawrence A. Wood. 11. The Processing and Compounding of GR-S, R. P. Dinsmore and R. D. Juve. 12. Physical Test Methods and Polymer Evaluation, A. E. Juve. 13. Aging and Stabilization of GR-S, John O. Cole. 14. Use of GR-S in Rubber Manufacture, R. A. Crawford. 15. Synthetic Rubber in Wires and Cables, John T. Blake. 16. Synthetic Hard Rubber, Frank S. Malm and Henry Peters. 17. Reclaimed Synthetic Rubber, F. L. Kilbourne, Jr. 18. Synthetic-Rubber Resins, J. D. D'Ianni. 19. GR-S Latex, L. H. Howland. 20. Latex Masterbatching, J. W. Adams and L. H. Howland. 21. Diene Polymers and Copolymers Other Than GR-S and the Specialty Rubbers, W. K. Taft and G. J. Tiger. 22. Neoprene, Arthur M. Neal and Leland R. Mayo. 23.

Nitrile Rubber, Waldo L. Semon. 24. Butyl Rubber, Robert M. Thomas and William J. Sparks. 25. Miscellaneous Synthetic Elastomers, C. H. Fisher, G. S. Whitby, and E. M. Beavers. 26. German Synthetic-Rubber Developments, R. L. Bebb and L. B. Wakefield.

The book is printed with clear type on very good paper and is bound in dark blue covers. Long lists of references are at the end of each chapter, and the double-columned name and subject indexes cover 58 pages. There are no noticeable typographical errors.

This book is very readable and is so full of information that its place is not on a shelf, but on your desk where it is always readily available.

HARRY L. FISHER

"The Measurement of Particle Size in Very Fine Powders." H. E. Rose. Chemical Publishing Co., Inc., New York, N. Y. Cloth, 5 by 7½ inches, 127 pages. Price, $2.75.

Intended for an audience of chemists and engineers working with powdered materials, the book consists of four public lectures on methods for determining particle shape and size, the range being 1-60 microns. Size frequency and residue curves are discussed as well as photo-extinction, water analysis, surface determination, and permeability test methods. Microscopic methods and margins for human and instrumental error are considered. Tables, graphs, and equations are included to facilitate calculations.

NEW PUBLICATIONS

Publications of B. F. Goodrich Chemical Co., Cleveland 15, O.:

"Hycar Technical Newsletter." Vol. 3, No. 11. 4 pages. This issue of the Newsletter is concerned with non-blooming heat-resistant formulations, Hycar resistance to OS-45 hydraulic fluid, and effect of immersion temperature on volume change. Also enclosed is a catalog of phenolic resins, produced by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y., which may be incorporated into rubbers such as Hycar.

"Hycar Latex Newsletter." Issue No. 8, February, 1955. 4 pages. The subjects discussed in this issue include the determination of Hycar present in textiles, latex for binding mineral pigments for paper coatings, thickeners for Hycar nitrile latices, defoamers for Hycar latex, and latex impregnation of cotton belting and leather.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"The General Story of Hypalon Chemical Rubber." Report No. 55-3. A. M. Neal. 16 pages. The chemistry, relation to other polymers, principles of compounding, and properties of Hypalon chlorosulfonated polyethylene are presented here.

"Neoprene Milking Inflations." BL-277. O. H. McCollum. 4 pages. Sample recipes for compounding neoprene milking inflations and their resultant physical properties are included in this booklet.

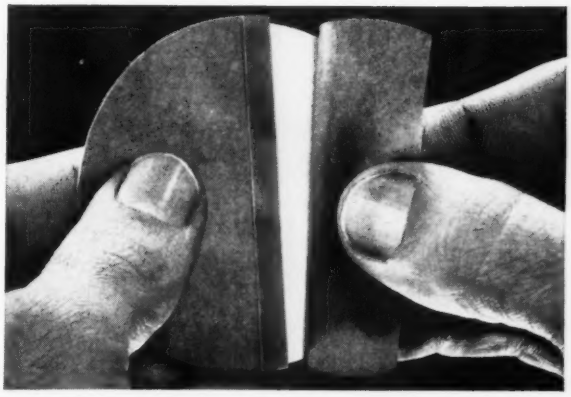
"Zenite Special." BL-278. R. W. Ward. 4 pages. The improvement in aging characteristics for vulcanizates when Zenite Special is used alone or in conjunction with an ultra-accelerator in GR-S latex compounds is discussed and documented.

"Non-Black Neoprene Footwear." BL-279. R. W. Bedwell. 4 pages. Included here is a sample recipe for the compounding of neoprene stocks suitable for colored footwear.

"Rental-Lease-Own Plan." #1107. Market Forge Co., Everett, Mass. 4 pages. This illustrated brochure describes how the firm's materials handling equipment can be rented, leased, or purchased.

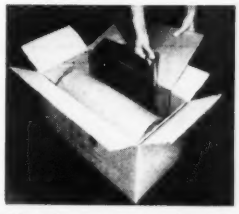
"The Thiazole Accelerators MBT and MBTS." Rubber Chemicals Technical Bulletin No. 839. American Cyanamid Co., Bound Brook, N. J. 32 pages. This booklet is a summary of currently available information on these accelerators, including applications, compounding characteristics, test data, and sample recipes.

New Patapar Releasing Parchments

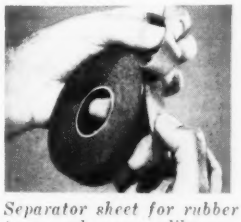


Better release...lower cost

The new releasing types of Patapar Vegetable Parchment have characteristics which make them ideal as a protective backing for pressure sensitive surfaces, separator sheets for uncured rubber, rubber tape, and as a wrapping material for tacky substances.



Effective separator sheet for uncured, natural, or synthetic rubbers



Separator sheet for rubber tape — releases readily

Some of Patapar's advantages:

- Dense, fibre-free surfaces
- Excellent release from tacky surfaces
- Releasing qualities remain constant as time passes
- High resistance against penetration or migration of rubber softeners
- Pressure sensitive surfaces retain full effectiveness
- Low cost

Send for Samples — We'll gladly send you technical data together with samples of the various new types of Patapar Releasing Parchments.

PATERSON PARCHMENT PAPER COMPANY
Bristol, Pennsylvania
West Coast Plant:
350 Bryant Street, San Francisco 7
Sales Offices: New York, Chicago

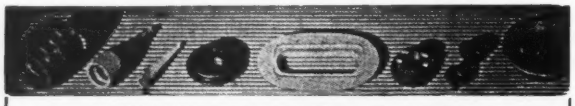
Write today.

Patapar®
Vegetable Parchment
HI-WET-STRENGTH-GREASE-RESISTING

HEADQUARTERS FOR VEGETABLE PARCHMENT SINCE 1885

Self Spraying
STATIKIL
PRESS BUTTON AND SPRAY
for RELIEF from STATIC ELECTRICITY
$3.00 PER CAN
Just Write STATIKIL
1220 W. 6th ST. CLEVELAND 13, OHIO

CUTTING—RUBBER—SOLES
NEW WELLMAN MACHINE
UNVULCANIZED RUBBER OR PLASTIC
BEVEL OR STRAIGHT EDGE
CUT PRECISION SOLES UP TO 1" THICK
WELLMAN CO., MEDFORD, MASS., U. S. A.



INDUSTRIAL RUBBER GOODS
BLOWN — SOLID — SPONGE
FROM NATURAL, RECLAIMED, AND SYNTHETIC RUBBER
THE BARR RUBBER PRODUCTS CO. SANDUSKY OHIO

AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS
NATIONAL SHERARDIZING & MACHINE CO.
868 WINDSOR ST. HARTFORD, CONN.
Representatives
Akron San Francisco New York

The Classified Ad Columns of RUBBER WORLD bring prompt results at low cost.

CONSULTANTS & ENGINEERS

GIDLEY LABORATORIES, INC.
PHILIP TUCKER GIDLEY — "RESEARCH IN RUBBER"
Consulting engineering, formulas, product development, chemical and physical tests and factory surveys.
Fairhaven Massachusetts

HALE & KULLGREN, INC.
Specialists in Processes and Plants for Rubber and Plastics.
A Complete Engineering Service
including: Economic Surveys; Process Design; Installation; Contracting and Operation.
613 E. Tallmadge Ave., Akron 10, Ohio

H. A. SCHLOSSER & CO.
Consultation and Technical Service
Paper, Textile and Wringer Rolls—Mechanicals
Molded Specialties—Cut Rubber Thread
401 INDUSTRIAL BANK BUILDING
PROVIDENCE 1, R. I.

FOSTER D. SNELL, INC.
Natural & Synthetic Rubber Technology
Compounding—Trouble Shooting—Testing
A personal discussion of your problems is suggested.
29 W. 15th St., New York 11, N. Y. WA 4-8800

"Gas Permeability of Rubber Compounds." Technical Service Laboratory Bulletin No. GD-11. Godfrey L. Cabot, Inc., Cambridge, Mass. 4 pages. This bulletin is a condensed survey of currently available literature on the permeability of rubber to gas, especially with reference to the tubeless tire.

"GR-S & GR-I Synthetic Rubbers." New and revised pages (date, 1-15-55). Office of Synthetic Rubber, Federal Facilities Corp., Washington 25, D. C. These sheets include Table H, Cold GR-S Latices; General Information, Page III, which reflects the addition of Socony-Vacuum XT-784-X and Sinclair Extract P-128 to the group of interchangeable aromatic processing oils; Pages 2101-1, 2102-1, 2103-1, 2104-1, 2105-1, and 2106-1, which are standard numbers assigned to certain experimental cold latices; and GR-S Cold Latices X-765 and X-767.

"Roll Shaft Fatigue Failure." Report No. 5. Rodney Hunt Machine Co., Orange, Mass. 2 pages. Drawings of basic fracture appearances of fatigue failures in mill roll shafts under load conditions of reversed bending and rotation are contained in this publication.

"Aging Properties of Low Sulfur Rubber Vulcanizates." Holger Leth Pedersen. Northern Cable & Wire Works, Ltd., Copenhagen, Denmark. 220 pages. An intensive treatment of the subject, this book (in English) covers such topics as degradation of vulcanizates by oxygen, testing methods, aging stability of stocks with different accelerators, simple and boosted systems of thiazoles, the influence of the filler, and many others, with special reference to CV curing requirements. Tables and graphs of performance data abound.

"A Guide to Better Fatty Acids." Wilson-Martin Division, Wilson & Co., Philadelphia, Pa. This is a rotating dial that shows at a glance the specifications and composition of 22 of the firm's fatty acid products, including three designed for use in rubber, as well as reporting temperature and color conversion data in terms of Gardner numbers.

"Chemical Index." Reilly Tar & Chemical Corp., Indianapolis, Ind. 6 pages. This catalog contains descriptions and cyclic representations of some 100 of the firm's organic chemicals, including acetylenic alcohols, fused ring heterocyclics, hydrocarbons, phenol and substituted phenols, and pyridine and pyridine derivatives.

"Automatic Proportioning Systems." Bulletin 0351. Richardson Scale Co., Clifton, N. J. 28 pages. This illustrated booklet describes the operation of the firm's Select-O-Weight proportioning system that permits remote dialing of individual ingredient weights, and details 11 installations now in use in such industrial applications as liquid latex blending, automatic rubber compounding, maintaining tension on nylon fabric being processed, glass batching, and net weighing with automatic tare compensation.

"American Standards." American Standards Association, New York, N. Y. 48 pages. Listed and indexed in this latest edition of the Association's publication are about 1,500 American Standards, including 11 for rubber, 165 for textiles, 74 for petroleum products, and 69 for chemicals. Prices are noted. There is a separate section on consumer goods.

"Armeens." Armour & Co., Chicago, Ill. 8 pages. The chemical structure, properties, and uses of the company's high molecular weight aliphatic primary and secondary amines are described in this booklet.

"Allis-Chalmers Electronic Metal Detector." Bulletin 15B7217B. Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4 pages. This illustrated folder describes and suggests uses of the company's device for electronically detecting impurities in finished goods such as rubber, plastics, textiles, and ceramics.

Publications of the British Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

"Load-Deflection Relations of Rubber Bush Mountings." No. 204. J. E. Adkins and A. N. Gent. 5 pages. This is a report of a study of the relation between applied force and deflection for bonded cylindrical rubber bush mountings of various dimensions for four principle modes of deflection. (Reprinted from the *British Journal of Applied Physics*, October, 1954.)

"On the Abrasion of Rubber." No. 205. A. Schallamach. 11 pages. This investigation of the abrasion of rubber, particularly in terms of abrasion patterns, showed the spacing of these patterns is proportional to the cube root of the normal load, proportional to the two-thirds power of the particle size on an abrasive with polyhedral particles, and directly proportional to the particle size on an abrasive with hemispherical particles. (Reprinted from the "Proceedings of the Physical Society," 1954.)

"Industrial Batch Ovens." Bulletin 5510. Blue M Electric Co., Blue Island, Ill. 4 pages. Specifications on five of the company's Power-O-Matic electronic furnaces and ovens are given here.

"Precision Electrical Instruments." Electro-Measurements, Inc., Portland, Oreg. 8 pages. Descriptions, specifications, photographs, and circuit diagrams of some of the firm's amplifiers and electrical laboratory instruments are included in this catalog.

"Colorants for Epoxy, Thiokol, Isocyanate, and Polyurethane Resins." Technical Bulletin No. 130. Claremont Pigment Dispersion Corp., Brooklyn, N. Y. 2 pages. Digested data on the company's "4000" series of colors for molding applications are reported.

"ASTM Standards on Rubber Products (With Related Information)." December, 1954. Prepared by ASTM Committee D-11 on Rubber and Rubber-Like Materials. Published by American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. Price, $5.50; ASTM members, $4.25. This special compilation of standards gives in convenient form all of the widely used standard methods of test and specifications on rubber developed by Committee D-11, including additions and revisions made since the last issue of this book in December, 1952. There is an appendix covering Proposed Methods of Testing Rubber Thread and regulations governing Committee D-11.

"Sealless Pumps Lick Tough Leakage Problems." Chempump Corp., Philadelphia, Pa. 3 pages. The installation and beneficial operation of the firm's centrifugal pumps at B. F. Goodrich Chemical Co.'s Avon Lake Experimental Station are described.

"Typical Properties of Cabot Rubber Blacks." Godfrey L. Cabot, Inc., Boston, Mass. Properties and test data in cold GR-S and natural rubbers of the firm's carbon blacks are summarized.

BIBLIOGRAPHY

Calorimetric Properties of 41 and 122° F. Polybutadienes. G. T. Furukawa, R. E. McCoskey, *J. Research Natl. Bur. Standards*, Dec., 1953.

Temperature Measurements in the Mooney Viscometer. G. E. Decker, R. D. Stiehler, *ASTM Bulletin*, Jan., 1954, p. 45.

Note on the Adjustment of Mooney Viscometer Die Closure. G. E. Decker, *ASTM Bulletin*, Jan., 1954, p. 51.

The Effect of Temperature on the Air Aging of Rubber Vulcanizates. A. E. Juve, M. G. Schoch, Jr., *ASTM Bulletin*, Jan., 1954, p. 54.

A New Impact Machine for Plastics and Insulating Materials. R. Burns, *ASTM Bulletin*, Jan., 1954, p. 61.

The Viscometric Detection of Branching in Polymers. I. L. H. Cragg, A. T. Brown, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 764. **II.** L. H. Cragg, G. R. H. Fern, p. 775.

(Continued on page 124)

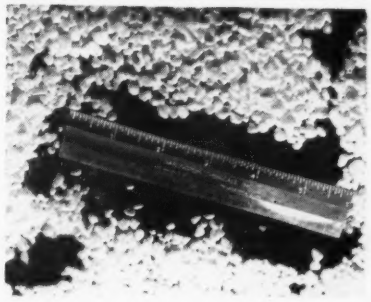
To Eliminate Dust and Cut Costs

IN NEOPRENE COMPOUNDING

Use DCI

"Tested and Proved"

GRANULAR LIGHT CALCINED MAGNESIA



Here is magnesia of the highest quality in granular form —practically dust-free. Each particle is uniform in crystal structure and chemical content. Strict manufacturing standards and quality control are your assurance of the cleanest and finest magnesia with low iron, calcium and manganese oxides content.

Additionally, protective packaging seals out dust and moisture. All of this means you get the important qualities in magnesia for neoprene compounding without paying a premium. Ask for a sample today. Test and you'll know. Write:

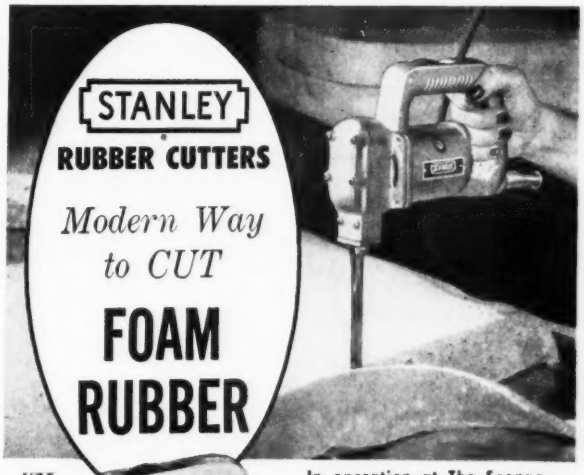
DARLINGTON CHEMICALS, INC.
1420 Walnut Street, Philadelphia 2, Pa.

Represented by:
Summit Chemical Co., Akron, Ohio
Tumpeer Chemical Co., Chicago, Ill.

STANLEY
RUBBER CUTTERS

Modern Way to CUT

FOAM RUBBER



NOS. 994-996

In operation at The Sponge Rubber Co., Inc., Shelton, Conn.

No Pinch • No Waste

Cuts Even • Cuts Quicker

Operator can follow template or any marked pattern. Cuts straight lines, curves or angles at up to 30 ft. a minute. For further information write, 894 Myrtle St., New Britain, Conn.

STANLEY ***Electric Tools***

HARDWARE • TOOLS • STEEL STRAPPING • STEEL

MARKET REVIEWS

Rubber

Prices on both the spot and futures markets during the major portion of the period from February 16 to March 15 continued their sharp collapse brought about by the new GSA rotation policy; R.S.S. #1 dropped a total of 8¢ a pound between February 11, when leaked rumors of the forthcoming announcement were first heard, and March 3, when normal supply and demand principles apparently supplied the bottom of the well. Thereafter the market staged a slow, if erratic, recovery, making up about 25% of the overall loss.

The GSA, however, was not the only villain of the piece. Giving momentum to the major collapse were such items as the Bank of England's action in raising the rediscount rate, the deceptive calm on the Formosan political front, and the nearness of final transfer of American synthetic plants to private hands.

No one is taken in by the momentary recovery of the market, and any prediction one might make of the immediate and long-range future can be only the sheerest speculation.

Trading on the Commodity Exchange during the period was the heaviest in five years. Sales for the second half of February reached 18,090 tons, bringing the monthly total to 32,410 tons. Sales for the first half of March amounted to 24,570 tons, resulting in an aggregate of 42,660 tons for the February 16-March 15 period. Near-March stocks were at 33.85¢ on February 16 and 31.10¢ on March 10, the end of their tenure.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures 1955	Jan. 22	Feb. 19	Feb. 26	Mar. 5	Mar. 12
Mar.	34.75	33.00	32.00	29.95	
May	34.35	32.65	31.80	30.00	31.99
July	34.05	32.30	31.35	29.65	31.30
Sept.	33.85	31.90	31.00	29.35	30.90
Dec.	33.40	31.65	30.70	29.05	30.30
1956					
Mar.	32.90	31.15	30.45	28.75	30.00
May					29.75
Total weekly sales, tons	7,460	11,870	7,890	11,140	9,310

On the physical market, R.S.S. #1 began the period at 35.00¢ a pound, fell with temporary and futile recoveries along the way to 30.00¢ a pound on March 3, rose to 32.25¢ on March 11, and ended the period at 31.75¢. February monthly average spot prices for certain grades were as follows: R.S.S. #1, 35.30¢; R.S.S. #3, 35.04¢; #3 Amber Blankets, 33.48¢; and Flat Bark, 30.90¢.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Jan. 22	Feb. 19	Feb. 26	Mar. 5	Mar. 12
R.S.S.:#1	35.13	33.50	32.50	31.00	32.25
2	35.00	33.38	32.38	30.88	32.13
3	34.88	33.25	32.25	30.75	32.00
Latex Crepe					
#1 Thick	38.00	35.50	35.00	34.00	34.88
Thin	37.50	35.25	34.75	33.75	34.13
#3 Amber Blankets	34.00	31.25	30.75	29.75	30.25
Thin Brown Crepe	33.50	31.00	30.50	29.50	30.00
Flat Bark	31.25	28.88	29.25	28.50	28.13

Latex

The *Hevea* latex market continued strongly active during the period from February 16 to March 15, spurred on by the unabated high levels of automotive production. Demand was heavy, and stocks remained in short supply. Slackened seasonal consumption, however, is already in view, and low supplies are not causing concern. Spring strikes, although a possibility, do not at the moment seem imminent, and the trade has no choice but to face that crisis when it appears, without previous preparation.

Last month's preliminary estimate of consumption for December was 8,010 tons, a figure which subsequently proved too high. The actual consumption of 7,671 tons is still a peak figure.

Spot prices for latex during the period were about 43¢, a small drop from last month's level, but remarkably stable in view of the nervousness of the natural rubber market.

Final December and preliminary January domestic statistics for natural and synthetic rubber latices follow:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Dec.	0	8,888	7,671	9,933
Jan.	0	—	7,460	9,646
GR-S				
Dec.	5,187	51	4,575	5,134
Jan.	6,094	105	4,685	5,718
Neoprene				
Dec.	729	0	600	1,087
Jan.	617	0	589	1,087
Nitrile				
Dec.	624	0	460	811
Jan.	624	0	469	847

Reclaimed Rubber

The reclaimed rubber market maintained its healthy condition during the period from February 16 to March 15 as automotive production continued in high gear and prices of natural rubber were still relatively high, despite the recent collapse of the rubber market. Business was expected to maintain its vigor, at least through April.

Reclaim prices were unchanged.

RECLAIMED RUBBER PRICES

	Lb.
Whole tire: first line	$0.10
Fourth line	.0875
Inner tube: black	.15
Red	.21
Butyl	.15
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Scrap Rubber

Trading was sluggish during the period from February 16 to March 15, with demand for Butyl tubes continuing to slacken. Reclaimers were limiting their purchases to immediate needs only. During early March some activity was noted in mixed auto tires in anticipation of a March shipment to Naugatuck.

Figures released by the United States Department of Commerce for the first 11 months of 1954 revealed that the year was a relatively good one, but not up to the 1953 levels. During the 11 months, 27,973,328 pounds of scrap rubber, valued at $695,618, were exported, compared to 30,774,452 pounds, worth $911,538, exported during all of 1953.

The price of Butyl tubes dropped 1¢ a pound at Eastern points and ¾¢ at Akron during the February 16-March 15 period. Red passenger tubes also fell ¼-½¢.

Current dealers' buying prices for scrap rubber grades, in carload lots delivered to mills at the points indicated, follow:

	Eastern Points (Per Net Ton)	Akron, O. (Per Net Ton)
Mixed auto tires	$11.00	$11.50
S. A. G. auto tires	Nom.	13.00
Truck tires	Nom.	14.00
Peelings, No. 1	40.00/41.00	40.00/42.00
2	Nom.	Nom.
3	15.50	Nom.
Tire buffing	17.00	15.00/16.00
	(¢ per Lb.)	
Auto tubes, mixed	4.00	4.00
Black	5.00	5.00
Red	7.25	7.00
Butyl	4.75	5.00

Cotton Fabrics

Trading on the industrial fabric market was generally sluggish during the period

INTRODUCING *fine particle* DOW CORNING 36 EMULSION

with greater stability than other silicone mold release emulsions

Moe Muscles used to claim that with Dow Corning mold lubricants he could meet the production quota standing on his head. After trying the new *fine particle* Dow Corning 36 Emulsion, however, he's willing to go one better. That's because he and Inspector Mike have learned that this really new silicone mold release agent establishes a new high in performance. It's more resistant to creaming or separation due to heat, cold, centrifuging or high dilution than any other silicone emulsion ever developed. Unaffected by additives or metals, Dow Corning 36 will not break in the tank even when diluted 100 to 1 and allowed to stand as long as 3 days.

Fine particle size accounts for the greatly increased stability of Dow Corning 36 Emulsion. Average particle size is less than 0.5 microns or about 1/10 that of previous silicone emulsions. Equally important in many applications is the fact that fine particle size also results in a further improvement in surface finish.

Furthermore, the new *fine particle* Dow Corning 36 Emulsion is available at the same low price as the regular Dow Corning mold release emulsions. That adds up to easier release, better appearance and fewer rejects at production costs that are lower than you ever experienced before. For further information and a generous free trial sample, return the coupon TODAY!

DOW CORNING CORPORATION • **Midland, Michigan** • **Dept.** 9404

Please send me:

☐ *Technical data on Dow Corning 36 Emulsion*

☐ *Free sample of Dow Corning 36 Emulsion*

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

DOW CORNING SILICONES

first in silicone release agents

DOW CORNING CORPORATION

MIDLAND • MICHIGAN

ATLANTA • **CHICAGO** • **CLEVELAND** • **DALLAS** • **DETROIT** • **LOS ANGELES** • **NEW YORK** • **WASHINGTON, D. C. (Silver Spring, Md.)**

Canada: Dow Corning Silicones Ltd., Toronto; **England:** Midland Silicones Ltd., London; **France:** St. Gobain, Paris

from February 16 to March 15, easing the consistent strength of the past two months. A moderately firm tone was displayed only by some grades of twills and cotton ducks. Some observers noted that the steady buying of ducks had tightened the nearby supply, with some ducks only obtainable in limited quantities for spot delivery, and substantial backlogs of orders in evidence among producers.

Trade sources report that the current slack demand for both carded and combed gray cloths for quick and nearby delivery was partially due to a bottleneck that had developed at finishing and fabric finishing plants. Finishing plants were running well behind the normal time required to finish gray goods. This time is usually four weeks, but six to eight weeks are now required. The longer time had consequently persuaded many consumers that these goods bought now will not be ready on time, and they have therefore curtailed their orders.

COTTON FABRICS

Drills			
59-inch 1.85 yd.	*yd.*	$0.37	$0.375
2.25-yd.		.31	.32
Osnaburgs			
40-inch 2.11-yd.	*yd.*	.2450	
3.65-yd		.155	
Raincoat Fabrics			
Printcloth, 38½-inch, 64x60, 5.35-yd.	*yd.*	.14 /	.1425
6.25 yd.		.12	
Sheeting, 48-inch, 4.17-yd.		.20	
52-inch, 3.85-yd.		.215 /	.22
Ducks			
38-inch 1.78-yd. S.F.	*yd.*	nom.	
2.00-yd. D.F.		nom.	
51.5-inch, 1.35-yd. S.F.		nom.	
Hose and belting		.67	
Chafer Fabrics			
14.40-oz./sq. yd. Pl.	*yd.*	.70	
11.65-oz./sq. yd. S.		.61	
10.80-oz./sq. yd. S		.6575	
8.9-oz./sq. yd. S.		.67	
Other Fabrics			
Headlining, 59-inch, 1.65-yd., 2-ply	*yd.*	.465	
64-inch, 1.24-yd., 2-ply		.595	
Sateens, 53-inch, 1.32-yd.		.54	
58-inch, 1.21-yd.		.59	

Rayon

Total calculated production of rayon and acetate yarn during February was 63,900,000 pounds, of which 33,000,000 pounds were regular tenacity yarn and 30,900,000 rayon high-tenacity yarn. Shipments of yarn amounted to 69,000,000 pounds, of which 36,600,000 pounds were regular tenacity and 32,400,000 pounds rayon high-tenacity yarn. Month-end stocks follow: regular tenacity, 42,300,000 pounds; rayon high-tenacity, 8,100,000 pounds; and total yarn, 50,400,000 pounds.

Both production and month-end stock figures represented small percentage losses over January figures. Shipments were up slightly.

Prices of its high-tenacity and super high-tenacity rayon tire yarns were raised 3¢ a pound by E. I. du Pont de Nemours & Co., Inc. As of this writing, competitive companies had not followed suit, but were expected to do so before long.

In the prices listed below, the maximum figures are for du Pont yarns.

RAYON PRICES

Tire Yarns		
High Tenacity		
1100/ 480	$0.62 /	$0.65
1100/ 490	.62 /	.64
1150/ 490	.62	
1165/ 480	.63	
1230/ 490	.62	
1650/ 720	.61 /	.64
1650/ 980	.61	.64
1875/ 980	.61	
2200/ 960	.60 /	.63
2200/ 980	.60	.64
2200/1466	.67	
4400/2934	.63	
Super High Tenacity		
1650/ 720	.64 /	.67
1900/ 720	.64 /	.67
Tire Fabrics		
1100/490/2	.72	
1650/980/2	.695 /	.73
2200/980/2	.685	

Masterbatches X-770, -771 Made Available by FFC

Single evaluation runs of X-770, an experimental oil-masterbatch polymer incorporating the naphthenic-type processing oil, Cyclolube, and X-771, a masterbatch polymer incorporating the aromatic-type processing oil, Lubrical, were made available to consumers ordering them before March 23, according to the Office of Synthetic Rubber, Federal Facilities Corp., Washington, D. C.

Both Cyclolube and Lubrical were substituted for other oils of the same types which had been incorporated in similar GR-S oil-masterbatch polymers.

X-770 is described as follows: 37.5 parts Cyclolube, plus 100 parts base polymer—23.5% bound styrene, sugar-free iron activated, rosin acid soap emulsified, 41° F. reaction temperature, 60% conversion, carbamate shortstop, non-staining antioxidant Polygard or equivalent, salt-acid coagulated; mean Mooney of masterbatch 45-65 ML-4 at 212° F.

X-771 is described similarly, except that Lubrical replaces Cyclolube in the recipe, and a staining stabilizer was employed instead of the non-staining antioxidant.

Financial

(*Continued from page 94*)

Plymouth Rubber Co., Inc., Canton, Mass. Year ended November 30, 1954: net profit, $422,355, equal to 47¢ a common share, compared with $225,164, or 25¢ a share, in the preceding fiscal year.

Skelly Oil Co., Kansas City, Mo. Year ended December 31, 1954: net income, $29,455,250, equal to $5.12 a share, against $31,276,785, or $5.44 a share, in 1953.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. Year to December 31, 1954: net profit, $38,637,629, equal to $4.18 a share, against $36,864,785, or $4.07 a share, in the previous year; sales, $431,016,283, against $451,964,697.

H. K. Porter Co., Inc., Pittsburgh, Pa. For 1954: net income, $3,215,786 (a new high), equal to $3.06 a common share, compared with $2,634,519, or $2.48 a share, in the preceding year; sales, $68,111,432, against $64,448,725.

St. Joseph Lead Co., New York, N. Y., and subsidiaries. For 1954: net earnings, $7,523,503, equal to $2.77 each on 2,716,222 capital shares, against $6,300,342, or $2.32 a share, the year before; net sales, $95,003,072, against $88,002,426; income taxes, $4,352,705, against $4,260,546.

Seiberling Rubber Co., Akron, O., and subsidiaries. For 1954: net profit, $215,789, equal to 2¢ each on 391,430 common shares, contrasted with $1,035,740, or $2.10 a share, in 1953; net sales, $35,714,299, against $40,351,305; federal income taxes, $180,143, against $1,003,131; current assets, $14,841,621, current liabilities, $4,682,900, against $15,946,988 and $4,867,573, respectively, the end of '53.

Taylor Instrument Cos., Rochester, N. Y. Six months ended January 31, 1955: net profit, $692,864, equal to $3.67 a share, against $557,906, or $2.95 a share, in the 1954 period.

The Eagle-Picher Co., Cincinnati, O., and domestic subsidiaries. Quarter to February 28, 1955: net profit, $706,508, equal to 71¢ a share, against $312,953, or 32¢ a share, a year earlier; net sales, $26,222,019, against $15,097,182.

U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y. For 1954: net loss, $156,651, contrasted with net profit of $126,181 in 1953.

United Carbon Co., Charleston, W. Va. For 1954: net income, $4,107,416, equal to $3.44 a share, against $3,886,558, or $3.26 a share, a year earlier.

United Elastic Corp., Easthampton, Mass. For 1954: net income, $1,268,850, equal to $4.69 a share, against $1,471,141, or $5.44 a share, the year before.

Westinghouse Air Brake Co., Wilmerding, Pa., and subsidiaries. For 1954: net profit, $7,763,546, equal to $1.88 a capital share, contrasted with $10,009,199, or $2.43 a share, the year before; net sales, $121,541,442, against $145,088,997; income taxes, $1,548,000, against $9,390,000.

S. S. White Dental Mfg. Co., Philadelphia, Pa. For 1954: net income, $733,756, equal to $1.99 a share, against $906,262, or $2.46 a share, in 1953.

for speed of EXTRUSIONS...

TRY THESE OUTSTANDING RC PLASTICIZERS

RC PLASTICIZER O-16

if you want { Increased Speeds / Low Specific Gravity / Improved Surface / Lower Brittle-points

RC PLASTICIZER DIOA

if you want { Resilience / Low Temperature Flex / High Efficiency / Low Color

Write today for samples!

We'll send you a brochure on other RC products that can speed your operation, make finished products better! You can rely on Rubber Corporation's 25 years of experience.

RUBBER CORPORATION OF AMERICA
New South Road, Hicksville, N. Y.
Sales Offices:
New York, Akron, Chicago, Boston

PROCESSORS
of
NYLON-RAYON
and
OTHER FABRICS
All Widths and Weights

With

RESORCINOL FORMALDEHYDE LATEX Compounds

Also

CAPITOL LINER PROCESS

Textile Proofers Inc.

193 Culver Avenue
Jersey City 5, N. J.

"A QUARTER OF A CENTURY EXPERIENCE"

STATISTICS of the RUBBER INDUSTRY

U. S. A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber

Long Tons

Year	Natural	GR-S	S-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1942	282,653	2,278	1,445	23	8,956	9,734	305,089
1943	55,329	181,470	789	1,373	33,603	14,487	287,052
1944	107,834	668,831	11,118	20,252	56,660	16,812	881,507
1945	135,672	717,693	7,163	52,378	45,672	7,871	966,449
1946	400,687	612,687	721	80,823	47,766	5,738	1,148,422
1947	688,354	405,496	3,362	62,824	31,495	6,618	1,198,149
1948	735,227	390,240	15,252	56,662	34,848	7,012	1,239,241
1949	660,792	288,882	21,717	54,046	35,215	11,072	1,071,724
1950	802,249	350,801	28,086	60,915	50,067	12,037	1,304,155
1951	733,048	694,583	9,946	76,475	58,907	15,333	1,588,292
1952	805,997	636,969	17,885	81,630	65,745	16,228	1,624,454
1953	647,615	668,386	12,342	79,801	80,495	20,198	1,508,837
1954							
Jan.	47,170	43,524	853	5,539	6,513	1,620	105,219
Feb.	42,645	40,661	1,030	4,801	6,206	1,574	96,917
Mar.	47,721	43,372	1,092	5,214	5,190	1,900	104,489
Apr.	49,855	34,384	1,167	6,004	5,601	1,645	98,656
May	55,983	35,117	1,120	4,581	4,828	1,960	103,589
June	66,698	35,829	1,263	3,182	5,101	1,696	113,769
July	40,614	35,415	1,388	4,960	4,673	1,814	88,864
Aug.	59,124	36,843	1,803	5,003	5,313	1,624	109,710
Sept.	48,618	38,937	2,183	4,675	6,036	1,718	102,167
Oct.	49,432	42,000	1,938	5,117	6,644	1,864	106,995
Nov.	45,474	41,109	2,021	5,060	6,839	1,913	102,416
Dec.	43,557	45,507	1,849	4,666	6,206	2,068	103,853
Total*	596,848	472,698	17,707	58,802	69,150	21,396	1,236,601

* Subject to year-end adjustment.
Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U. S. A. Consumption of Natural (Including Latex) and Synthetic Rubber

(Long Tons)

Year	Natural	GR-S	S-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1942	376,791	1,105	1,564	22	6,833	8,217	394,442
1943	317,634	131,108	789	304	26,205	12,405	488,525
1944	144,113	494,115	1,437	10,763	46,243	14,112	710,783
1945	105,429	598,434	1,711	43,012	42,394	8,029	799,009
1946	277,597	631,405	721	79,228	44,357	5,988	1,039,296
1947	562,661	446,316	2,273	68,838	37,703	4,536	1,122,327
1948	627,332	334,233	11,080	58,870	32,118	5,771	1,069,404
1949	574,522	299,420	21,717	52,664	31,753	8,827	988,903
1950	720,268	388,427	27,803	66,348	43,781	11,930	1,258,557
1951	454,015	617,200	9,244	70,500	48,887	13,066	1,212,912
1952	453,846	648,816	17,604	71,229	55,522	13,866	1,260,883
1953	553,473	611,748	12,433	77,826	65,900	16,929	1,338,309
1954							
Jan.	46,960	37,707	982	5,438	4,774	1,272	97,133
Feb.	46,897	36,765	942	5,696	4,467	1,190	95,957
Mar.	53,709	42,074	1,062	6,300	5,177	1,447	109,769
Apr.	51,451	40,194	1,130	6,241	4,684	1,395	105,105
May	51,398	40,030	1,144	5,602	4,486	1,366	104,026
June	54,253	43,782	1,192	5,961	4,769	1,491	111,448
July	37,894	31,474	1,326	4,108	3,499	1,145	79,446
Aug.	38,069	30,800	1,596	3,569	4,647	1,439	80,120
Sept.	52,412	40,204	1,994	5,138	5,049	1,493	106,290
Oct.	55,970	45,002	2,061	4,711	4,931	1,604	114,279
Nov.	53,326	44,429	1,980	3,967	5,276	1,635	110,613
Dec.	55,096	50,540	1,935	4,583	5,434	1,638	119,226
Total*	597,435	483,001	17,344	61,314	57,203	17,115	1,233,412

* Subject to year-end adjustment.
Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

• CRUDE RUBBER
• LIQUID LATEX
• CHEMICALS

E. P. LAMBERT CO.

FIRST NATIONAL TOWER
AKRON 8, OHIO
HEmlock 4-2188
MEMBER — COMMODITY EXCHANGE, Inc.

Coumarone Resins — Reclaiming Oils — Plasticizers
Powdered Rubber

FLEXO JOINTS

THE STANDARD FOR SAFETY

• Proved in years of efficient service, FLEXO JOINTS offer the flexibility of hose — the strength of pipe — the ideal steam connection for presses, tire molds, etc.
Four styles, for standard pipe sizes ¼" to 3".
• Write for information and prices.

FLEXO SUPPLY CO., INC., 4651 Page Blvd., St. Louis 13, Mo. *In Canada:* S. A. ARMSTRONG, LTD. 1400 O'Connor Dr., Toronto 13, Ontario

SINCE 1880 RUBBER & PLASTIC

Rand REG. U. S. PAT. OFF.

"They Last Longer" REG. U. S. PAT. OFF.

DRESS SHIELDS — RUBBER APRONS
DRESS SHIELD LININGS — STOCKINET SHEETS
BABY PANTS — RUBBER SHEETS
BABY BIBS & APRONS — RAINCAPES & COATS
SANITARY WEAR — RUBBER SPECIALTIES
RUBBERIZED SHEETING — VINYL PLASTIC
RUBBER DAM & BANDAGES — SHEET GUM — SHEETING

RAND RUBBER CO. BROOKLYN, N. Y. U. S. A. MFRS.

HOWE MACHINERY CO., INC.
30 GREGORY AVENUE PASSAIC, N. J.
Designers and Builders of
"V" BELT MANUFACTURING EQUIPMENT
Cord Latexing, Expanding Mandrels, Automatic Cutting, Skiving, Flipping and Roll Drive Wrapping Machines.
ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT
Call or write.

QUALITY **INTEGRITY** **SERVICE**
74 YEARS WITHOUT REORGANIZATION

BELTING
Transmission—Conveyor—Elevator

HOSE
for every purpose
Water—Fire—Air—Steam

HOME RUBBER CO. TRENTON, N. J. STEAM NEVER BURN BLOW OUT PACKING. CHICAGO NEW YORK

PACKING
Sheet & Rod Packings
for every condition

Mechanical Specialties of Every Description
HOME RUBBER COMPANY
Factory & Main Office
TRENTON 5, N. J.

LONDON: 107 Clifton St., Finsbury CHICAGO: 168 North Clinton St. NEW YORK: 80-82 Reade St

U. S. A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1942	13,450					13,450
1943	5,638					5,638
1944	2,443					2,443
1945	3,121					3,121
1946	4,865					4,865
1947	5,033					5,033
1948	11,235					11,235
1949	5,063					5,063
1950	4,927					4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953						
Jan.	6,340	4,940	1,143	913	6,996	13,336
Feb.	6,905	5,041	1,167	971	7,179	14,084
Mar.	6,738	4,804	1,075	880	6,759	13,497
Apr.	7,428	4,815	1,233	833	6,881	14,309
May	7,648	5,254	1,163	715	7,132	14,780
June	8,094	5,744	1,069	593	7,406	15,500
July	9,256	5,861	1,162	514	7,537	16,793
Aug.	10,273	5,081	1,127	617	6,825	17,098
Sept.	11,370	4,794	1,122	638	6,554	17,924
Oct.	11,126	4,990	1,133	737	6,860	17,986
Nov.	10,834	4,533	1,064	743	6,340	17,174
Dec.	13,532	4,794	1,117	721	6,632	20,164
1954						
Jan.	12,375	5,001	1,019	703	6,723	19,098
Feb.	13,963	5,269	963	625	6,857	19,820
Mar.	11,870	5,247	975	588	6,810	18,680
Apr.	10,803	5,273	1,062	600	6,935	17,738
May	8,907	5,180	1,110	655	6,945	15,852
June	9,460	5,591	1,020	646	7,257	16,717
July	10,171	5,363	1,004	831	7,198	17,369
Aug.	12,009	4,220	1,019	993	6,232	18,241
Sept.	11,546	4,504	984	908	6,396	17,942
Oct.	10,952	4,745	1,001	950	6,696	17,648
Nov.	9,759	4,943	1,055	939	6,937	16,696
Dec.	9,933	5,134	1,087	811	7,032	16,965

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U. S. A. Stocks of Synthetic Rubber

(Long Tons)

Year	S-Types	Butyl	Neoprene	N-Type	Total
1942	1,050	4	1,786	1,172	4,012
1943	36,395	1,033	6,644	3,223	47,295
1944	122,412	9,992	12,262	5,366	150,032
1945	170,571	18,378	9,703	4,802	203,454
1946	83,090	19,478	10,470	3,755	116,793
1947	40,606	13,184	5,237	3,339	62,366
1948	96,304	10,995	5,072	2,762	115,133
1949	77,743	12,224	4,654	3,433	98,054
1950	36,942	7,243	5,733	2,840	52,758
1951	105,271	12,481	8,379	3,821	129,952
1952	83,861	22,716	8,535	3,875	118,987
1953					
Jan.	83,921	21,096	9,001	3,857	117,875
Feb.	81,550	19,560	9,078	3,911	114,099
Mar.	84,013	19,581	8,738	3,757	116,089
Apr.	89,839	19,144	9,364	3,694	122,041
May	100,873	18,376	8,986	3,874	132,109
June	112,770	18,141	9,073	3,805	143,789
July	127,278	18,280	10,036	3,892	159,486
Aug.	134,936	20,269	10,008	3,939	169,152
Sept.	132,453	21,280	9,671	4,221	167,625
Oct.	129,655	22,435	10,138	4,496	166,724
Nov.	127,464	23,401	11,067	4,591	166,523
Dec.	135,153	24,866	11,480	4,346	175,845
1954					
Jan.	138,692	24,733	13,065	4,349	180,839
Feb.	143,202	23,573	12,518	4,112	183,405
Mar.	145,178	22,329	12,575	4,202	184,284
Apr.	136,446	21,673	12,665	4,199	174,983
May	131,604	20,077	11,467	4,435	167,583
June	124,678	17,534	10,646	4,314	157,172
July	128,752	18,150	11,315	4,727	162,944
Aug.	135,164	19,672	10,710	4,613	170,159
Sept.	128,313	18,513	10,288	4,548	161,662
Oct.	127,204	18,653	11,038	4,272	161,167
Nov.	121,772	19,338	11,429	4,366	156,905
Dec.	115,499	19,247	11,349	4,080	150,175

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U. S. A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1942	9,595		210	....	210	9,805
1943	1,890	194	1,512	....	1,706	3,596
1944	3,090	6,580	4,683	....	11,263	14,353
1945	4,768	15,176	7,077	....	22,253	27,021
1946	8,012	24,810	13,595	....	38,405	46,417
1947	17,675	22,474	6,089	....	28,563	46,238
1948	32,630	21,494	5,022	....	26,516	59,146
1949	29,974	21,357	3,651	....	25,008	54,982
1950	54,401	31,339	5,725	....	37,064	91,465
1951	54,963	32,972	6,866	2,948	42,786	97,749
1952	48,228	42,273	7,598	4,164	54,035	102,263
1953	75,511	48,112	9,026	5,844	62,982	138,493
1954						
Jan.	5,396	4,089	592	471	5,152	10,548
Feb.	5,681	3,928	742	375	5,045	10,726
Mar.	5,682	4,142	709	483	5,334	11,016
Apr.	5,663	4,046	803	461	5,310	10,973
May	3,806	3,839	680	623	5,142	8,940
June	6,590	4,019	620	585	5,224	11,814
July	5,181	2,589	448	643	3,680	8,861
Aug.	7,571	1,995	756	682	3,433	11,004
Sept.	6,480	4,190	676	581	5,447	11,927
Oct.	7,210	5,190	742	780	6,712	13,922
Nov.	6,335	5,115	717	558	6,390	12,725
Dec.	8,888	5,238	729	624	6,591	15,479
Total*	74,483	48,379	8,214	6,866	63,459	137,942

* Subject to year-end adjustment.

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U. S. A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1942	286,007	254,820	30,405	42,532
1943	304,058	291,082	15,678	46,201
1944	260,631	251,083	11,800	43,832
1945	243,309	241,036	13,413	28,155
1946	295,612	275,410	14,461	33,666
1947	291,395	288,395	14,556	35,943
1948	266,861	261,113	11,428	32,630
1949	224,029	222,679	10,367	28,263
1950	314,008	303,733	11,740	35,708
1951	366,700	346,121	14,722	45,082
1952	274,981	280,002	11,180	30,664
1953				
Jan.	27,258	25,356	866	31,244
Feb	24,583	24,098	950	30,631
Mar.	27,964	27,334	1,115	30,280
Apr.	29,032	26,483	1,261	31,263
May	27,142	25,213	964	31,763
June	26,554	24,637	962	32,791
July	23,292	23,414	807	31,506
Aug.	22,607	22,666	638	30,318
Sept.	23,469	22,409	894	30,147
Oct.	23,649	21,944	823	30,692
Nov.	21,323	19,638	1,086	31,226
Dec.	21,463	18,858	1,031	32,319
Yr.-end adj.		+ 3,000	....	....
Total	298,336	285,050	11,397	....
1954				
Jan.	20,026	19,114	912	31,865
Feb.	21,122	19,461	941	32,393
Mar.	23,383	22,882	830	32,148
Apr.	21,658	21,883	1,050	31,359
May	21,316	20,436	1,071	31,105
June	22,342	22,321	1,068	30,845
July	18,041	16,301	586	31,304
Aug.	15,519	17,660	647	27,692
Sept.	22,352	19,926	641	29,632
Oct.	23,566	22,098	808	30,395
Nov.	22,986	22,321	862	29,451
Dec.	25,790	24,546	816	30,746
*Total:	258,101	249,049	10,232	....

* Subject to year-end adjustment.

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

EAGLE-PICHER

Lead & Zinc Compounds

meet the specific demands of the rubber industry . . .

Eagle-Picher manufactures a comprehensive line of both lead and zinc compounds for the rubber industry. Rigid product control is maintained from the ore to the finished product. More than a century of experience assures you of customer service unequalled in the field.

Zinc Oxides	Litharge
Basic White Lead Silicate	Sublimed Litharge
Basic Carbonate of White Lead	Red Lead (95% 97% 98%)
Sublimed White Lead	Sublimed Blue Lead

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY

Since 1843

General Offices: Cincinnati 1, Ohio

On the Pacific Coast: ASSOCIATED LEAD AND ZINC COMPANY
2700 16th Ave., S. W., Harbor Island, Seattle 4, Wash. • 1336 16th St., Oakland 7, Calif.
444 Market St., San Francisco 11, Calif. • 1329 Willow St., Los Angeles 13, Calif.

Thomaston TEXTILES

for the RUBBER INDUSTRY

specifically engineered to meet your needs

TIRE FABRICS
HOSE AND BELT DUCKS
CHAFERS
YARNS • THREADS • CORDAGE
SHEETINGS • COATING
FABRICS • DIVERSIFIED
COTTON FABRICS

DEPENDABLE THOMASTON Fabrics SINCE 1809

We invite your inquiries

Thomaston Mills

THOMASTON, GEORGIA • NEW YORK OFFICE: 40 WORTH STREET
AKRON, OHIO OFFICE, 308 AKRON SAVINGS AND LOAN BUILDING

D P R®

100% ALL RUBBER SOLIDS

Natural & synthetic rubbers in flowable form.

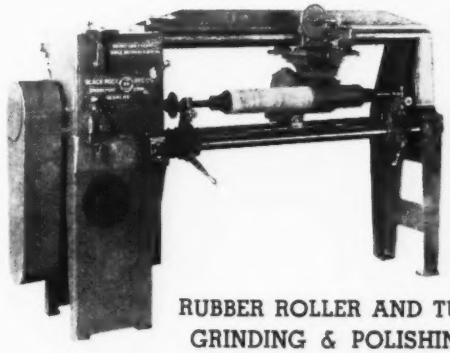
Also special grades having superior compatibility with asphalt and polyethylene.

TECHNICAL LABORATORY INFORMATION AND SAMPLES UPON YOUR REQUEST

ORIGINATORS OF QUALITY DEPOLYMERIZED RUBBERS
"SINCE 1906"

DPR, INCORPORATED
A Subsidiary of H. V. HARDMAN CO.
571 CORTLANDT STREET
BELLEVILLE 9, N. J.

A Dual Purpose Machine For Grinding and Polishing



RUBBER ROLLER AND TUBE GRINDING & POLISHING MACHINE (4-LM)

Wide and flexible range of speeds and feeds insure profitable production grinding and polishing of tubes and medium size rollers.

FINE BR TOOLS

BLACK ROCK MFG. CO.
175 Osborne Street Bridgeport 5, Conn.

U. S. A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1942	9,392	....	200	....	200	9,592
1943	9,578	150	1,400	....	1,550	11,128
1944	6,085	6,000	4,400	....	10,400	16,485
1945	3,886	14,500	6,800	....	21,300	25,186
1946	5,714	23,500	13,000	....	36,500	42,214
1947	13,909	22,500	6,500	....	29,000	42,909
1948	28,489	21,500	5,250	....	26,750	55,239
1949	36,117	21,500	3,750	....	25,250	61,367
1950	56,138	31,000	5,500	....	36,500	92,638
1951	46,750	31,031	6,279	2,628	39,938	86,688
1952	53,567	40,562	7,368	3,093	51,023	104,590
1953	67,375	46,473	7,981	3,654	58,108	125,483
1954						
Jan.	5,882	3,475	615	275	4,365	10,247
Feb.	5,595	3,568	575	250	4,393	9,988
Mar.	6,610	3,982	729	335	5,046	11,656
Apr.	5,892	3,748	603	324	4,675	10,567
May	5,969	3,394	586	348	4,328	10,297
June	5,884	3,653	629	402	4,684	10,568
July	4,298	2,587	482	296	3,365	7,663
Aug.	5,228	2,834	561	351	3,746	8,974
Sept.	6,903	3,599	628	379	4,606	11,509
Oct.	7,527	4,347	612	376	5,335	12,862
Nov.	7,622	4,411	631	411	5,453	13,075
Dec.	7,671	4,575	600	460	5,635	13,306
Total*	75,081	44,173	7,251	4,207	55,631	130,712

* Subject to year-end adjustment.

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U. S. A. Exports of Synthetic Rubber

(Long Tons)

Year	S-Types	Butyl	Neoprene	N-Type	Total
1942	222		1,037	160	
1943	14,937	40	2,540	631	17,608
1944	98,380	530	4,799	557	104,266
1945	76,555	980	5,837	406	83,778
1946	68,763	495	2,642	797	72,697
1947	7,951	62	2,617	755	11,385
1948	1,093	21	2,875	885	4,874
1949	1,401	178	3,330	1,574	6,483
1950	900	31	4,826	1,895	7,652
1951	483	216	6,825	1,725	9,249
1952	9,467	126	9,813	2,695	22,101
1953					
Jan.	298	43	961	165	1,467
Feb.	458	114	566	124	1,262
Mar	548	0	930	213	1,691
Apr.	414	47	818	210	1,489
May	943	3	1,127	201	2,274
June	769	2	741	257	1,769
July	765	4	905	236	1,910
Aug.	820	3	895	257	1,975
Sept.	702	0	1,065	456	2,223
Oct.	455	4	915	303	1,677
Nov.	729	11	1,155	409	2,304
Dec.	791	6	1,416	414	2,627
Total	7,692	237	11,494	3,245	22,668
1954					
Jan.	618	0	434	295	1,347
Feb.	508	2	1,251	287	2,048
Mar.	1,265	416	930	288	2,899
Apr.	520	62	1,296	454	2,332
May	1,115	373	844	395	2,727
June	881	216	694	215	2,006
July	1,126	421	1,220	358	3,125
Aug.	1,314	384	945	307	2,950
Sept.	785	53	978	270	2,086
Oct.	1,284	189	1,301	455	3,229
Nov.	659	575	1,081	435	2,750
Dec.	994	140	1,088	396	2,618
Total*	11,069	2,831	12,062	4,155	30,117

* Subject to year-end adjustment.

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U. S. A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumers Price Index
		All Rubber Products			
1939	121	$27.84	39.9	$0.75	....
1949	186	57.79	38.3	1.51	101.8
1950	203	64.42	40.9	1.56	102.8
1951	219	68.70	40.6	1.69	111.0
1952	212	74.48	40.7	1.83	113.5
1953	221	77.78	40.3	1.93	114.4
1954					
Jan.	205.7	75.08	38.7	1.94	115.2
Feb.	202.9	75.47	38.9	1.94	115.0
Mar.	199.4	74.31	38.5	1.93	114.8
Apr.	195.2	75.08	38.7	1.94	114.6
May	197.0	77.81	39.7	1.96	115.0
June	198.4	79.60	40.2	1.98	115.1
July	173.1	76.83	39.4	1.95	115.2
Aug.	177.0	76.25	39.1	1.95	115.0
Sept.	198.9	77.81	39.3	1.98	114.7
Oct.	204.2	81.20	40.4	2.01	114.5
Nov.	206.6	83.22	41.2	2.02	114.6
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1949	83.6	63.26	36.4	1.74	
1950	87.8	72.48	39.8	1.82	
1951	90.8	77.93	39.6	1.97	
1952	92.9	85.65	40.4	2.12	
1953	93.0	88.31	39.6	2.23	
1954					
Jan.	86.4	82.88	37.5	2.21	
Feb.	85.3	83.03	37.4	2.22	
Mar.	84.7	80.89	36.6	2.21	
Apr.	83.2	84.14	37.9	2.22	
May	83.9	88.65	39.4	2.25	
June	85.0	92.06	40.2	2.29	
July	67.3	87.01	38.5	2.26	
Aug.	68.0	85.65	37.4	2.29	
Sept.	85.2	86.18	38.3	2.25	
Oct.	86.5	90.39	39.3	2.30	
Nov.	85.6	95.47	40.8	2.34	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1949	21.6	48.94	38.6	1.27	
1950	20.6	52.21	40.1	1.30	
1951	25.3	57.81	41.0	1.41	
1952	22.9	62.22	40.4	1.54	
1953	23.7	65.60	40.0	1.64	
1954					
Jan.	21.5	62.98	38.4	1.64	
Feb.	20.5	65.57	39.5	1.66	
Mar.	19.6	65.51	39.7	1.65	
Apr.	19.2	63.58	38.3	1.66	
May	19.8	65.46	39.2	1.67	
June	19.8	67.30	40.3	1.67	
July	20.1	68.45	40.5	1.69	
Aug.	20.5	66.40	40.0	1.66	
Sept.	21.0	66.08	39.1	1.69	
Oct.	21.9	71.34	41.0	1.74	
Nov.	22.2	71.51	41.1	1.74	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1949	80.9	54.38	40.1	1.36	
1950	94.3	59.76	42.2	1.42	
1951	102.9	63.26	41.4	1.53	
1952	96.0	66.58	41.1	1.62	
1953	104.1	70.93	41.0	1.73	
1954					
Jan.	97.8	70.62	39.9	1.77	
Feb.	97.1	70.40	40.0	1.76	
Mar.	95.1	70.22	39.9	1.76	
Apr.	92.8	69.30	39.6	1.75	
May	93.3	70.98	40.1	1.77	
June	93.6	70.98	40.1	1.77	
July	85.7	70.62	39.9	1.77	
Aug.	88.5	71.15	40.2	1.77	
Sept.	92.7	72.36	40.2	1.80	
Oct.	95.8	74.98	41.2	1.82	
Nov.	98.8	75.12	41.5	1.81	

Source: BLS, United States Department of Labor.

•

Reprints of "The Shrinkage of Mold Cured Elastomer Compositions," by Juve and Beatty, from our October, 1954, issue, are available at 10¢ each

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES

Light face type $1.25 per line (ten words)
Bold face type $1.60 per line (eight words)
Allow nine words for keyed address.

SITUATION WANTED RATES

Light face type 40c per line (ten words)
Bold face type 55c per line (eight words)

SITUATIONS OPEN RATES

Light face type $1.00 per line (ten words)
Bold face type $1.40 per line (eight words)

Letter replies forwarded without charge, but no packages or samples.

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS WANTED

PRODUCTION MANAGER, TECHNICAL DIRECTOR, OR SUPERvisor available. Strong practical experience for production of mechanicals, sponge rubbers, cements, adhesives, and plastics extrusion—compression molded. Low cost, highest production minded with greatest departmental efficiency. Address Box No. 1697, care of RUBBER WORLD.

DEVELOPMENT ENGINEER & TECHNOLOGIST

Rubber and plastics engineer seeks new connection with progressive, well-established organization. Over 25 years' experience continuously in the chemical and development fields of molding, fabric coating, paper treatment, pressure-sensitives, and product development in rubber, latex, and synthetic resins, including polyesters. Also diversified chemical fields covering laboratory direction, engineering executive and consulting work. B.S. in chemistry, with mechanical design and plant layout experience. Patents registered and outstanding commercial development credits. Desire eastern or N. Y. metropolitan area in rubber, plastics, or allied fields. Address Box No. 1698, care of RUBBER WORLD.

TECHNICAL SALESMAN—CHEMICAL ENGINEER AND LATEX Technologist desires to represent an aggressive company in the sales of latices, compounds, dispersions, emulsions, plastisols, and organisols. Complete background in formulation, compounding, fabricating of old and developing of new products. Administrative background would assist in establishing of branch office. Interested in East Coast, South, Midwest, or West Coast. Available soon. Address Box No. 1699, care of RUBBER WORLD.

MANAGER AND TECHNICAL MAN WITH 20 YEARS' EXPERIence in sales, production, technical and labor relations desires a responsible position with a reliable company. Can handle production, production control, maintenance, personnel, mold design, etc. Address Box No. 1700, care of RUBBER WORLD.

CHEMICAL ENGINEER: RUBBER AND PLASTICS TECHNOLogist with broad experience in natural and synthetic latices, high polymers, dispersions and plastisols involving laboratory, pilot-plant, process development and plant evaluations of current and new products and technical sales. Good educational background in high polymers. Presently employed, desires position with progressive organization. Address Box No. 1705, care of RUBBER WORLD.

SITUATIONS OPEN

RUBBER COMPOUNDER WITH AN INTEREST IN MATErials, and having 2 to 3 years' minimum industrial experience plus a B.S. degree, or the equivalent in additional industrial experience, for developmental and technical service work with an active raw materials supplier of long standing. This position does not require travel, but demands a mature individual of initiative who is deeply interested in building a higher place for himself and his organization in the rubber industry. Please send summary of education and experience, expected salary, and photograph. NEVILLE CHEMICAL CO., Pittsburgh 25, Pa.

REAL OPPORTUNITY

. . . for man who can qualify for position of Assistant Sales Manager. Must have a successful record selling to rubber industry. Preference will be given to technical education and factory or laboratory experience. Replies held in strictest confidence. Please give age, education and experience. Box No. 1686, Care of RUBBER WORLD.

CHIEF CHEMIST RUBBER

for opening with medium-sized independent Eastern firm, experienced in compounding synthetic and natural rubber for mechanical molded goods, extrusions, and lathe cut items. Extensive experience in automotive and aeronautical specification compounding essential. Please address résumé of experience, qualifications, and salary requirements to:
BOX NO. 1688, c/o RUBBER WORLD

AN UNUSUAL SALES OPPORTUNITY

If you are a graduate chemist or chemical engineer, and are capable of handling a sales management position, you should be interested in this excellent opportunity. Sales experience in rubber industry desirable. Write details concerning experience, age, education, etc. All correspondence confidential. Box No. 1687, Care of RUBBER WORLD.

SITUATIONS OPEN (Continued)

Exceptional opportunity for rubber chemists having from two to five years' experience in the rubber industry and holding degrees in chemistry or chemical engineering. Development and sales service work with well established Eastern firm. Excellent laboratory facilities. Opportunity for contacts with customers, salesmen and production people.

Your reply will be held confidential. Please give age, experience and education.

Employees know of this ad.

ADDRESS BOX NO. 1625, c/o RUBBER WORLD

RUBBER TECHNOLOGIST
TECHNICAL SALES SERVICE

Large eastern chemical manufacturer has technical sales service opening in synthetic rubber and rubber chemicals. Age 25 to 35. Several years experience in rubber manufacture. College degree. Foreign languages, preferably German and French, very desirable but not essential. Should be willing to make headquarters in Europe. Excellent opportunity in rapidly expanding field. Write giving in full detail, age, education and experience. Replies held strictly confidential. Our employees know of this ad.

Address Box No. 1683, c/o RUBBER WORLD

RUBBER COMPOUNDER

Nationally known rubber manufacturer has an excellent opportunity for a rubber compounder. Company desires an individual who is a chemist or a chemical engineer. Position would be in our company sales department. Please submit complete educational background, employment history, and salary requirements to Box No. 1689, care of RUBBER WORLD.

MECHANICAL RUBBER GOODS PLANT IN CALIFORNIA REquires young graduate chemist, with at least two years' actual compounding experience in this line. Excellent opportunity with successful established company. Replies confidential. Address Box No. 1690, care of RUBBER WORLD.

WANTED: RUBBER CHEMIST WITH PREVIOUS EXPERIENCE in expanded cellular soling desirable, but not essential. Experience in the molded rubber goods field necessary. Process Engineer also desired. Must have previous rubber chemistry experience. Prefer chemical engineering graduate. Work is for medium-size rubber company located in northern Virginia. Address Box No. 1691, care of RUBBER WORLD.

RUBBER CHEMIST

Chemical Engineer or Chemist—experienced in compounding and development of natural and synthetic rubber for central Research Laboratory of leading multi-plant electrical wire and cable manufacturer. Excellent opportunity. Cable experience not essential. Send résumé and salary requirements to: Mr. B. A. Blewis, GENERAL CABLE CORPORATION, Avenue A & First Street, Bayonne, N. J.

TECHNICIANS AND SUPERVISORS

Thoroughly familiar with closed cell expanded rubber for nationally known rubber manufacturer. Top salaries and unusual opportunity for advancement. Replies confidential. Give complete résumé in first letter. Address Box No. 1692, care of RUBBER WORLD.

TIRE SUPERINTENDENT WANTED

Progressive Midwest plant has excellent opening for a fully experienced tire superintendent. Must be of major executive caliber and have A-1 references. Write fully age, experience, qualifications. Replies kept in strictest confidence. Address Box No. 1693, care of RUBBER WORLD.

U. S. A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
Passenger Car						
1945	1,115	25,463	222	26,800	28,200	2,214
1946	11,086	54,684	653	66,243	66,466	1,763
1947	19,644	52,857	1,608	74,109	77,795	5,444
1948	21,589	41,295	656	63,540	66,738	8,773
1949	28,129	36,440	509	65,077	65,140	8,904
1950	36,678	47,103	642	84,423	78,598	3,050
1951	26,729	34,226	723	61,678	65,546	6,973
1952	24,106	45,458	741	70,305	74,341	11,251
1953	33,106	45,798	809	79,713	81,455	13,044
1954						
Jan.	2,549	3,378	59	5,986	5,251	12,279
Feb.	2,323	3,001	60	5,384	5,952	12,832
Mar.	2,809	3,753	45	6,607	6,878	13,112
Apr.	2,785	4,328	95	7,208	7,031	12,955
May	2,695	4,503	101	7,300	6,985	12,575
June	2,587	5,326	89	8,002	7,755	12,323
July	2,516	5,222	73	7,812	5,605	10,063
Aug.	2,283	4,605	73	6,961	4,709	7,797
Sept.	1,375	3,825	73	5,273	6,242	8,950
Oct.	1,617	3,422	81	5,120	6,702	10,531
Nov.	2,823	2,844	91	5,758	6,480	11,331
Dec.	3,383	2,845	87	6,315	7,215	12,228
Total	29,746	47,043	928	77,717	76,806	
Truck and Bus						
1945	4,869	11,016	282	16,167	16,324	863
1946	4,224	10,806	859	15,889	15,832	685
1947	5,412	10,014	1,648	17,074	17,755	1,505
1948	5,256	7,853	1,132	14,241	14,576	1,925
1949	3,456	7,026	958	11,440	11,228	1,734
1950	4,671	9,705	788	15,164	14,156	743
1951	5,424	10,386	954	16,764	17,859	1,791
1952	5,378	8,884	779	15,041	16,070	2,859
1953	4,843	9,326	734	14,904	14,696	2,676
1954						
Jan.	342	615	59	1,016	1,048	2,698
Feb.	311	556	57	924	1,089	2,877
Mar.	354	597	71	1,022	1,103	2,966
Apr.	346	607	81	1,035	1,034	2,951
May	324	612	83	1,020	980	2,928
June	303	703	71	1,076	1,041	2,895
July	265	725	82	1,073	755	2,577
Aug.	243	824	51	1,118	717	2,188
Sept.	227	711	57	995	1,037	2,233
Oct.	251	828	66	1,145	1,167	2,268
Nov.	301	716	67	1,084	1,145	2,345
Dec.	325	625	81	1,031	1,229	2,546
Total	3,592	8,111	826	12,529	12,347	
Total automotive						
1945	5,984	36,479	504	42,967	44,524	3,077
1946	15,310	65,490	1,512	82,312	82,298	2,448
1947	25,056	62,871	3,256	91,183	95,550	6,949
1948	26,845	49,148	1,787	77,781	81,314	10,698
1949	31,584	43,466	1,467	76,517	76,369	10,638
1950	41,349	56,808	1,430	99,587	92,754	3,794
1951	32,153	44,612	1,677	78,442	83,405	8,765
1952	29,484	54,342	1,520	85,346	90,411	14,110
1953	37,949	55,124	1,543	94,617	96,150	15,720
1954						
Jan.	2,891	3,993	118	7,002	6,299	14,977
Feb.	2,634	3,557	117	6,308	7,042	15,709
Mar.	3,163	4,350	116	7,629	7,981	16,077
Apr.	3,131	4,935	176	8,243	8,065	15,906
May	3,020	5,115	184	8,319	7,965	15,504
June	2,890	6,029	160	9,079	8,796	15,218
July	2,782	5,948	155	8,884	6,360	12,640
Aug.	2,527	5,429	123	8,079	5,427	9,985
Sept.	1,602	4,537	130	6,269	7,279	11,184
Oct.	1,868	4,251	147	6,266	7,869	12,799
Nov.	3,124	3,560	158	6,842	7,626	13,676
Dec.	3,707	3,470	169	7,346	8,444	14,774
Total	33,338	55,154	1,754	90,246	89,153	

Source: The Rubber Manufacturers Association, Inc.

U. S. A. Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1945	5,988	33,906	411	40,304	41,742	3,627
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,240	42,671	811	84,723	80,179	—
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	63,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954						
Jan.	2,884	3,892	58	6,834	5,395	10,107
Feb.	2,636	2,908	74	5,617	5,896	10,448
Mar.	3,165	2,774	74	6,013	6,399	10,869
Apr.	3,134	2,770	97	6,001	6,266	11,234
May	3,017	2,900	84	6,002	5,909	11,170
June	2,889	3,657	85	6,631	5,739	10,379
July	2,707	3,471	87	6,265	4,132	8,429
Aug.	2,174	3,504	69	5,747	3,773	6,588
Sept.	1,130	2,839	64	4,033	4,489	7,179
Oct.	429	2,566	92	3,087	3,953	8,313
Nov.	449	2,142	90	2,681	3,245	8,706
Dec.	476	2,019	74	2,569	3,201	9,299
Total	25,090	35,442	948	61,480	58,397	

Source: The Rubber Manufacturers Association, Inc.

Bibliography

(Continued from page 113)

Rapid Plastometry. J. R. Scott, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 954.

Self-Closing Grips for Rubber. A. J. Stubbs, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 968.

Current Problems in Shipping Natural Rubber. M. W. Allen, *Rubber Age (N. Y.)*, Dec., 1953, p. 383.

Tire Temperature Measurement at the Government Tire Test Fleet. V. J. Horning, *Rubber Age (N. Y.)*, Dec., 1953, p. 395.

Synthetic Rubber Protects the Navy's Propeller Shafts. E. A. Bukzin, *Mech. Eng.*, Jan., 1954, p. 17.

Theoretical Design of the Rubber-Oil-Black Masterbatch. S. C. Einhorn, L. A. McLeod, *Trans. Inst. Rubber Ind.*, Dec., 1953, p. 281.

White Factice in Cold Cured Rubber Proofings—A Laboratory Study, Part 1. C. F. Flint, C. B. Featherstone, *Trans. Inst. Rubber Ind.*, Dec., 1953, p. 287.

Disposal—White Elephant Sale? J. T. Cox, Jr., *Chem. Eng. News*, Jan. 4, 1954, p. 25.

More Plastics from Petroleum. E. E. McSweeney, E. L. Kropa, *Chem. Eng. News*, Jan. 4, 1954, p. 27.

Chemical and Physical Properties of Alkyl Aryl Phosphates. H. R. Gamrath, R. E. Hatton, W. E. Weesner, *Ind. Eng. Chem.*, Jan., 1954, p. 208.

Electrical Conductivity of Rubber-Carbon Black Vulcanizates. B. B. S. T. Boonstra, E. M. Dannenberg, *Ind. Eng. Chem.*, Jan., 1954, p. 218.

Structural Changes in Rubber Caused by the Action of Molecular Oxygen. V. Z. Tarasova, B. Dogadkin, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 787.

Degradation of Natural Rubber in Solution in Vacuo. W. F. Watson, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 798.

The Effect of Comonomer on the Microstructure of Butadiene Copolymers. F. C. Foster, J. L. Binder, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 832.

Self-Inhibition in the Oxidation of Butadiene-Acrylonitrile Rubbers. A. S. Kuzminskii, E. B. Popova, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 840.

Effect of Carbon Black on the Development of Oxidation Processes in Raw and Vulcanized Rubbers. A. S. Kuzminskii, L. I. Lyubchanskaya, N. G. Khitrova, S. I. Bass, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 858.

Ultrasonic Wave Study of Swollen Buna N Rubber. A. W. Nolle, J. F. Mifsud, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 884.

Chlorination of Natural Rubber in Solution with Gaseous Chlorine. C. S. Ramakrishnan, D. Raghunath, J. B. Pande, *Rubber Chem. Tech.*, Oct.-Dec., 1953, p. 902.

SITUATIONS OPEN—Continued

RUBBER CHEMIST

Thoroughly familiar with compounding of molded rubber goods, heels and soles. Top salary and unusual opportunity for growth and advancement. All replies confidential. Give complete resumé in first letter. Address Box No. 1694, care of RUBBER WORLD.

LATEX CHEMISTS, CHIEF AND ASSISTANTS, EXPERIENCED development, formulation, and production of can and jar sealing compounds, flow-in gaskets, also for technical sales service. All replies confidential. CAN-TITE RUBBER CORP., 1105 Metropolitan Avenue, Brooklyn 11, N. Y.

RUBBER CHEMIST

Lab experience in compounding and testing necessary. Familiarities with production equipment very helpful. Responsible position; salary commensurate with experience and ability. FELT PRODUCTS MFG. CO., 1504 W. Carroll Avenue, Chicago 7, Illinois.

RUBBER CHEMISTS

Degree in chemistry or chemical engineering. Up to five years' experience in rubber and polymer processing, development, or production. Progressive company, well-equipped laboratory, permanent position with opportunity for advancement in expanding operation. Write giving age, experience, and education. Replies held confidential. Box 369, ERIE, PENNSYLVANIA.

RUBBER PLANT MANAGER TO TAKE COMPLETE CHARGE of medium-sized mechanical and cut goods plant in Southeast. Must have experience in production, costs, equipment, and molds. Excellent opportunity with expanding company. Address Box No. 1695, care of RUBBER WORLD.

CHEMIST
LATEX COMPOUNDS

Long-established and progressive manufacturer desires chemist with experience in compounding natural and synthetic latices. Position offers excellent opportunity in laboratory carrying out new product development and application work. Please give details of experience, education, and salary desired. Our employes have been informed of this advertisement. Address Box No. 1696, care of RUBBER WORLD.

MACHINERY & SUPPLIES FOR SALE

FOR SALE: 1—FARREL-BIRMINGHAM 32" x 92" INVERTED-L, 4-roll calender, reduction drive, D. C. varispeed motor; 1—Royle #4 extruder, motor driven; 4—Wymac 150-ton molding presses, 16" x 16", electrically heated platen; 1—6" x 12" laboratory mill, m.d.; 1—Ball & Jewell #2 rotary cutter, 15-HP motor; 3—#28 Devine vacuum shelf dryers, 19-59" x 78" shelves, complete; 1—Farrel-Birmingham 20" x 22" x 60" mill, top cap frame, Falk reduction drive, 100-HP motor; 2—Farrel-Birmingham 16" x 42" mills with reduction drive and 100-HP motor; 1—Read 2,000-lb. all steel double-ribbon horizontal mixer; 3—Colton #5½ single punch tablet machines, m.d.; also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. WANTED: Your Surplus Rubber Machinery. CONSOLIDATED PRODUCTS COMPANY, INC., 64 Bloomfield St., Hoboken, N. J.; HOboken 3-4425; N. Y. Phone: BArclay 7-0600.

FOR SALE: NEW—"ROSS"—SIZE 860—TYPE BCP HEAT EXchangers—single pass—83.5 Sq. Ft. Heat Transfer Surface. All Metal Construction. 8⅝" Diameter x 6'2-7/8" lg. Overall. Price: $250.00 each, f. o. b. Phila., Pa. Full Details and Drawing available upon request. J. A. DOUGHERTY, P. O. Box 90, Bala-Cynwyd, Pa.

FOR SALE: NEW "STRUTHERS-WELLS" VERTICAL HIGH-pressure feedwater heaters. 6 Pass—206 Sq. Ft. Surface. Shell Diameter 18" x 7'10½" High. Price: $550.00 each. Drawing and Operating Data available upon request. J. A. DOUGHERTY, P. O. Box 90, Bala-Cynwyd, Pa.

FOR SALE: 4 PLACE OXYGEN BOMB WITH WATER BATH. Meets ASTM D572. Complete. Never used. Make offer. Address Box No. 1701, care of RUBBER WORLD.

THE AKRON RUBBER MACHINERY CO. INC.
"ARMACO"
New Rubber & Plastics Machinery
ALSO
A complete stock of used reconditioned guaranteed machinery for rubber & plastic.
Phone HE 4-9141 **P. O. Box 88, Akron 9, Ohio**

FOR SALE

1—Adamson-United rod type laboratory press, 20" x 20" platens, arranged for but not including electric heating elements, water cooled, temperature control range 200 to 550° F. Having one 20" daylight opening, ram diameter 15", 20" stroke.

Operates on 2000# hydraulic low pressure of 13 g.p.m. and high pressure of 1 g.p.m.

Includes all pumps, valves, motor and controls.

Press is new and is prepared for immediate shipment.

For further information or appointment to inspect write, wire or phone:

S. H. Snee or F. L. Leffard. Phone BRandywine 1-1490.

Westinghouse Air Brake Company
WILMERDING, PENNSYLVANIA

New Parts
FOR NO. 3 and 5
ROYLE EXTRUDERS
Consisting of
BEARINGS, GEARS, SCREWS, STRAINER PLATES, ETC.
BOX 1106
1474 BROADWAY, NEW YORK CITY

RUBBER HARDNESS
THE LANGUAGE OF THE RUBBER INDUSTRY SINCE 1915
DUROMETER
VARIOUS MODELS FOR TESTING THE ENTIRE RANGE
TECHNICAL DATA ON REQUEST
THE SHORE INSTRUMENT & MFG. CO., INC.
90-35 VAN WYCK EXPRESSWAY
JAMAICA 2, N. Y.

NEW and REBUILT MACHINERY
Since 1891
L. ALBERT & SON
Trenton, N. J., Akron, Ohio, Chicago, Ill., Los Angeles, Calif.

GUARANTEED REBUILT MACHINERY
IMMEDIATE DELIVERIES FROM STOCK
MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS
HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS
UNITED RUBBER MACHINERY EXCHANGE
183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya		Indonesia		All Other	Total
	Estate	Native	Estate	Native		
1947	360.5	285.8	12.8	265.2	335.7	1,260.0
1948	403.6	294.6	101.7	330.6	394.5	1,525.0
1949	400.8	270.7	169.1	263.9	385.5	1,490.0
1950	376.7	317.4	175.1	521.4	469.4	1,860.0
1951	328.8	276.5	222.5	591.9	465.3	1,885.0
1952	341.7	242.5	293.2	456.0	456.6	1,790.0
1953						
Jan.	31.4	23.6	27.4	39.6	43.0	165.0
Feb.	23.5	19.2	26.4	18.5	32.4	120.0
Mar.	27.0	16.9	25.7	29.2	36.2	135.0
Apr.	26.2	16.9	23.8	30.3	32.8	130.0
May	27.9	17.7	22.9	38.0	33.5	140.0
June	27.3	17.1	24.2	34.0	34.9	137.5
July	30.2	20.5	26.8	38.4	34.1	150.0
Aug.	29.6	21.5	23.2	35.5	35.2	145.0
Sept.	29.0	18.5	22.4	36.8	40.8	147.5
Oct.	30.1	19.3	25.2	28.7	41.7	145.0
Nov.	29.0	19.4	24.9	26.0	45.7	145.0
Dec.	30.6	22.0	28.9	35.4	48.1	165.0
Total	341.8	232.6	301.8	390.4	458.4	1,725.0
1954						
Jan.	30.3	19.1	24.2	34.9	44.0	152.5
Feb.	25.4	18.0	23.0	30.2	30.9	127.5
Mar.	24.6	17.5	23.2	36.7	35.5	137.5
Apr.	24.8	15.4	21.2	37.0	34.1	132.5
May	27.6	18.6	22.9	32.9	30.5	132.5
June	27.0	16.3	21.0	33.5	39.7	137.5
July	31.0	23.0	26.8	46.2	38.0	165.0
Aug.	30.9	21.6	21.9	37.1	38.5	150.0
Sept.	30.1	23.4	23.6	46.4	41.5	165.0
Oct.	29.5	20.8	23.9	45.6	40.2	160.0
Nov.	31.9	22.9	24.3	36.8	46.6	162.5
Dec.	30.4	24.2	24.5	47.0	53.9	180.0
Total	343.5	240.8	280.5	464.3	473.4	1,802.5

Source: BDSA, United States Department of Commerce; and Secretariat of the International Rubber Study Group.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	U.S.S.R.* and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1947	562.7	57.2	153.6	336.5	547.3	1,100.0
1948	627.3	121.0	193.7	480.5	795.2	1,422.5
1949	574.5	132.5	184.3	546.2	863.0	1,437.5
1950	720.3	152.5	219.7	612.5	984.7	1,705.0
1951	454.0	136.3	234.2	675.5	1,046.0	1,500.0
1952	453.8	146.8	197.3	652.1	996.2	1,450.0
1953						
Jan.	47.8	10.8	17.9	58.5	87.2	135.0
Feb.	45.2	18.2	15.4	56.2	89.8	135.0
Mar.	50.7	18.5	15.6	60.2	94.3	145.0
Apr.	49.4	11.0	18.4	58.7	88.1	137.5
May	46.9	11.3	16.3	58.0	85.6	132.5
June	48.2	5.0	15.7	63.6	84.3	132.5
July	43.9	3.1	16.8	63.7	83.6	127.5
Aug.	43.7	2.0	14.2	55.1	71.3	115.0
Sept.	45.2	9.3	17.8	65.2	92.3	137.5
Oct.	46.8	3.8	21.3	65.6	90.7	137.5
Nov.	43.3	4.4	20.2	82.1	106.7	150.0
Dec.	42.4	4.5	17.0	66.1	87.6	130.0
Total	553.5	101.9	206.6	753.0	1,061.5	1,615.0
1954						
Jan.	47.0	7.8	20.3	67.4	95.5	142.5
Feb.	46.9		17.5	70.6	88.1	135.0
Mar.	53.7	2.7	19.1	72.0	93.8	147.5
Apr.	51.4	15.5	19.7	68.4	103.6	155.0
May	51.4	1.1	18.8	66.2	86.1	137.5
June	54.2	3.6	18.0	64.1	85.7	140.0
July	37.9	0.8	17.7	68.6	87.1	125.0
Aug.	38.1	8.9	14.2	63.8	86.9	125.0
Sept.	52.4	11.5	19.3	71.8	102.6	155.0
Oct.	56.0	3.5	23.1	74.9	101.5	157.5
Nov.	53.3	2.3	19.2	75.2	96.7	150.0
Dec.	55.2	5.0	19.6	72.7	97.3	152.5
Total	597.5	62.7	226.5	835.7	1,124.9	1,725.0

* Estimated.
Source: BDSA, United States Department of Commerce and Secretariat of the International Rubber Study Group.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany*	Total
1946	740.0	51.0	5.6	806.6
1947	508.7	42.4	8.2	559.3
1948	488.3	40.5	3.4	532.2
1949	393.7	46.6	....	440.3
1950	476.2	58.4	....	534.6
1951	845.2	62.3	0.9	908.4
1952	798.6	74.3	4.9	877.8
1953	848.4	80.9	6.3	935.6
1954				
Jan.	57.3	7.3	0.4	65.0
Feb.	53.4	6.7	0.4	60.5
Mar.	55.8	7.4	0.5	63.7
Apr.	47.6	7.1	0.6	55.3
May	46.6	7.3	0.5	54.4
June	45.9	5.9	0.5	52.3
July	47.0	5.8	0.5	53.3
Aug.	48.8	7.3	0.7	56.8
Sept.	51.4	7.9	0.6	59.9
Oct.	55.6	8.0	0.6	64.2
Nov.	55.0	8.0	0.7	63.7
Dec.	58.5	7.9	....	....
Total	622.9	86.6	....	....

Source: Secretariat of the International Rubber Study Group.
* British Zone only from 1945 to 1947; Bizone for 1948 and 1949; Federal Republic since 1950.

World Consumption of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdom	Total† Continent of Europe	World† Grand Total
1946	761.7	29.6	30.1	75.0	912.5
1947	559.7	29.2	2.8	32.5	625.0
1948	442.1	20.6	2.6	15.0	480.0
1949	414.4	18.1	2.4	14.0	450.0
1950	538.3	22.6	2.8	16.0	580.0
1951	758.9	26.4	3.9	22.3	812.5
1952	807.0	33.6	4.9	35.0	885.0
1953	784.8	35.9	4.9	39.3	872.5
1954					
Jan.	50.2	2.6	0.6	3.8	57.5
Feb.	49.1	3.0	0.5	4.0	57.5
Mar.	56.1	2.9	0.7	4.3	65.0
Apr.	53.6	2.7	0.8	4.0	62.5
May	52.6	2.7	0.7	4.0	60.0
June	57.2	2.8	0.7	4.3	67.5
July	41.5	1.9	0.6	4.3	50.0
Aug.	42.1	2.0	0.7	3.5	47.5
Sept.	53.9	2.4	0.8	4.5	62.5
Oct.	58.3	2.1	1.0	4.3	65.0
Nov.	57.3	2.6	0.8	4.3	65.0
Dec.	63.5	2.4	0.8	....	72.5
Total	635.4	30.1	8.7	....	735.0

Source: Secretariat of the International Rubber Study Group.
* Includes latices.
† Figures estimated or partly estimated.

U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Value of Sales*			Manufacturers' Inventories*		
	1952	1953	1954	1952	1953	1954
Jan.	408	424	348	809	866	844
Feb.	402	435	351	842	868	857
Mar.	400	473	388	857	880	849
Apr.	407	444	375	850	874	812
May	402	422	357	855	888	810
June	409	436	377	851	914	829
July	377	448	374	890	925	784
Aug.	388	409	337	877	897	761
Sept.	427	416	334	871	908	804
Oct.	423	395	332	866	881	838
Nov.	383	346	388	850	867	819
Dec.	418	369	418	877	868	817
Total	4,844	5,017	4,379	Aver. 858	853	819

*Adjusted for seasonal variation.
Source: Office of Business Economics, United States Department of Commerce.

MACHINERY & SUPPLIES FOR SALE—Continued

FARREL 16" X 48" AND 15" X 36", 2-ROLL RUBBER MILLS, and sizes up to 84". New and used lab. 6" x 12" & 6" x 16" Mills and Calenders. American Tool 300-gallon Churns. Extruders 1" to 6". Baker-Perkins Jacketed Mixers 100, 50, and 9 gals. HPM 200-ton Hydr. Press 30" x 48" platens. Brunswick 200-ton 21" x 21" platens. 150-ton, 20" x 20" platens. Large stock Hydraulic Presses 12" x 12" to 48" x 48" platens. Hydraulic Pumps and Accumulators. Rotary Cutters. Stokes Molding Presses. Single-Punch & Rotary Preform Machines. Banbury Mixers, Crushers, Churns, Bale Cutters, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT CO., 107–8th St., Brooklyn 15, N. Y. STerling 8-1944.

FOR SALE: 1—NATIONAL-ERIE 8½" STRAINER; 1—24" X 66" 3-Roll Calender; 1—Thropp 6" x 16" lab mill; 2—Adamson 380-ton hydraulic presses; also mixers, vulcanizers, mills, et cetera. CHEMICAL & PROCESS MACHINERY CORP., 146 Grand Street, New York 13, N. Y.

FOR SALE: 1—MOTORIZED LATEX DIPPING MACHINE WITH 24" x 36" trays. 1—Circulating steel Latex Dipping Tank coated against corrosion, size 24" x 40". 2—new Stainless Steel Tanks, one used for coagulant and one used for leaching, size 24" x 42". 1—10' Floor-type Dipping Machine Track. 1—Pangborn Air Blast Cleaning Machine. 1—Electric Furnace. This machinery is new and can be shipped immediately as we need the space. Address Box No. 1702, care of RUBBER WORLD.

BUYING-SELLING

OFFERING NEW MACHINERY

All kinds of *used* machinery for the Rubber and Allied Industries.

Hydraulic Presses, Laboratory Mills and Presses, Sponge Rubber Vulcanizing Presses, Drilled Steel Steam Platens, Rubber Bale Cutters guillotine type, Vulcanizers with quick opening doors, etc.

HIGH EFFICIENCY IN QUALITY, PRICE AND DELIVERY TIME

ERIC BONWITT 431 S. Dearborn Street Chicago 5, Ill.

MACHINERY & SUPPLIES WANTED

WANTED: RUBBER MACHINERY INCLUDING BANBURY MIXers, Heavy Duty Mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters. Hydraulic Equipment. Rotary and Vacuum Shelf Driers. Injection Molding Machines. Will consider a now operating or shut-down plant. P. O. Box 1351, Church Street Sta., New York 8, N. Y.

INTERESTED IN PURCHASING ODD LOTS OF RESIN AND OFF resin. Any quantity; large quantities preferred. Reply in detail sending samples and identify material offered. Address Box No. 1703, care of RUBBER WORLD.

WANTED: USED DOUBLE-OPENING HYDRAULIC PRESS, 20 TO 30' long, 40 to 50" wide. S. M. COFFEY, c/o PALM FECHTELER CO., 85 Maple Street, Weehawken, N. J.

WANTED: USED #6 TUBING MACHINE, WITH OR WITHOUT Camelback Head and Motor. WANTED: used 24" x 24" press, two 9" openings, 18" stroke, 252 tons @ 2,000 psi., with or without pumping unit. Advise price, make, and condition. SILVER MOON TIRE & WHEEL CO., 3301 Jensen Drive, Houston 10, Texas.

BUSINESS OPPORTUNITIES

RUBBER MOLDS

I will invest up to $5,000 in rubber molds for the manufacture of any item which will stand careful scrutiny. GEORGE B. FARWELL, 1045 Sonoma Avenue, Menlo Park, Calif.

CUSTOM DIPPING

We have open time on our latex dipping machines. Send drawings or samples and specifications for estimates on your requirements to Blake, Box 152, West Hanover, Mass.

PENNSYLVANIA RUBBER MANUFACTURER NOW IN OPERAtion, sales potential $750,000.00, will consider sale of plant, including equipment, land, buildings, and good will to principals only. Address Box No. 1704, care of RUBBER WORLD.

Custom Mixing RUBBER-PLASTICS

We do milling and compounding of all types—black or color—master batches

All mixing done under careful supervision and laboratory control.

Phone: Butler 9-0400

Pequanoc Rubber Co.

MANUFACTURERS OF RECLAIMED RUBBER

MAIN SALES OFFICE and FACTORY: BUTLER, N. J.

USED MACHINERY FOR SALE

1—Baldwin 5' x 6' horizontal Vulcanizer, quick opening door, ASME 150 psi.

1—National Rubber Machinery Company—2½" Plastic Extruder, jacketed for hot oil.

1—Welding Engrs. 4" Stainless Steel Double Screw Rubber Extruder w/15 HP Explosion Proof motor.

1—Thropp 2-roll Laboratory Rubber Mill, 6" x 12".

1—Calander Mill 2 roll 12" x 24" w/motor drive.

WE ARE INTERESTED IN PURCHASING INDIVIDUAL ITEMS AND COMPLETE PLANTS

R. GELB & SONS Inc.

STATE HIGHWAY No. 22, UNION, N.J.

MURDOCK-6-4900

Economical **NEW** Efficient

Mills - Spreaders - Churns

Mixers - Hydraulic Presses

Calenders

...GUARANTEED...

Rebuilt Machinery for Rubber and Plastics

LAWRENCE N. BARRY

41 Locust Street Medford, Mass.

MIXING

To Your Specification

K. B. C. INDUSTRIES, INC. NEW HAVEN, CONN.

881 State Street Tel: State 7-5662

Otto J. Lang, General Manager

MANUFACTURING BUSINESS WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies "confidentially" C. J. GALE, Sec., P. O. Box 1351, Church St. Station, New York 8, N. Y.

WE WISH TO PURCHASE OUTRIGHT

A Rubber Plant making mechanical goods doing a volume of no less than $500,000.00 per annum. All replies will be held in strict confidence.

ADDRESS BOX NO. 1685

C/O RUBBER WORLD

Carbon Black Statistics—Second Half, 1954

Below are statistics for output, shipments, producers' stocks, and exports of carbon black for the second half, 1954. Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; FEF, fast extruding furnace black; and HAF, high abrasion furnace black.

(Thousands of Pounds)

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Production							
Furnace types							
Thermal	8,975	9,443	9,329	8,754	8,222	8,380	53,103
SRF	22,948	19,486	17,168	17,659	22,153	22,338	121,752
HMF	7,968	8,066	8,119	8,649	7,485	8,606	48,893
FEF	14,499	14,658	12,588	14,900	15,869	14,798	87,312
HAF	31,990	32,604	32,910	35,874	38,527	44,785	216,690
Total furnace	86,380	84,257	80,114	85,836	92,256	98,907	527,750
Contact types	32,839	32,000	30,666	31,050	30,663	31,814	188,532
Totals	119,219	116,257	110,780	116,886	122,919	130,721	716,782
Shipments							
Furnace types							
Thermal	7,260	8,696	9,316	10,086	9,568	13,581	58,507
SRF	19,368	18,557	23,744	23,070	23,921	27,045	135,705
HMF	7,296	6,099	8,111	7,956	8,424	8,891	46,777
FEF	12,395	11,240	13,129	13,608	14,239	16,924	81,535
HAF	35,099	28,380	36,171	40,114	40,863	45,688	226,315
Total furnace	81,418	72,972	90,471	94,834	97,015	112,129	548,839
Contact types	33,072	33,719	38,205	38,461	38,654	39,302	221,413
Totals	114,490	106,691	128,676	133,295	135,669	151,431	770,252
Producers' Stocks, End of Period							
Furnace types							
Thermal	12,527	13,274	13,286	11,954	10,608	5,407	67,056
SRF	35,311	36,240	29,664	24,253	22,485	17,778	165,731
HMF	22,818	24,785	24,793	25,486	24,547	24,262	146,691
FEF	22,873	26,291	25,750	27,042	28,672	26,546	157,174
HAF	61,280	65,504	62,243	58,003	55,667	54,764	357,461
Total furnace	154,809	166,094	155,736	146,738	141,979	128,757	894,113
Contact types	218,505	216,786	209,247	201,836	193,845	186,357	1,226,576
Totals	373,314	382,880	364,983	343,574	335,824	315,114	2,115,689
Exports							
Furnace types	15,533	18,053	—	19,614	18,631	21,089	—
Contact types	18,615	16,861	—	18,381	14,661	16,759	—
Totals	34,148	34,914	—	37,995	33,292	37,848	—

Source: Bureau of Mines, United States Department of the Interior, Washington 25, D. C.

CALENDAR of COMING EVENTS

April 18-21
A.M.A. National Packaging Exposition. International Amphitheatre, Chicago, Ill.

April 20
Washington Rubber Group. Potomac Electric Power Co. Bldg., Washington.

April 28-29
American Zinc Institute. Thirty-Seventh Annual Meeting. Drake Hotel, Chicago.

April 29
Chicago Rubber Group, Inc. Furniture Club, Chicago, Ill.

Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

May 1-4
American Institute of Chemical Engineers. National Meeting. Shamrock Hotel, Houston, Tex.

May 3
The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

May 3-6
Second International Rubber Quality & Packaging Conference. Essex House, New York, N. Y.

May 4-6
Division of Rubber Chemistry, American Chemical Society, Sheraton-Cadillac Hotel, Detroit, Mich.

May 7-15
Society of the Plastics Industry, Inc. Annual Meeting & Conference. Cruise on the *Queen of Bermuda*.

May 11-13
American Institute of Chemists. Thirty-Second Annual Meeting. Chicago, Ill.

May 12
Northern California Rubber Group.

May 16-20
Materials Handling Exposition. International Amphitheatre, Chicago, Ill.

May 17
Elastomer & Plastics Group, Northeastern Section, A. C. S. Massachusetts Institute of Technology, Cambridge, Mass.

May 18
Washington Rubber Group, Potomac Electric Power Co. Bldg., Washington.

May 20
Connecticut Rubber Group.

May 20
Buffalo Rubber Group. Joint Meeting with Ontario Rubber Section. Hotel Brock, Niagara Falls, Ont., Canada.

May 30-June 1
Chemical Institute of Canada. Thirty-Eighth Annual Conference. Quebec, P.Q.

June 2
Rhode Island Rubber Club Outing. Pawtucket Country Club, Pawtucket, R. I.

June 4
Southern Ohio Rubber Group. Summer Outing. Inland Activities Center.

June 4-5
The Los Angeles Rubber Group, Inc. Summer Outing. Coronado Island.

June 10
Fort Wayne Rubber & Plastics Group. Summer Outing.

June 17
Akron Rubber Group. Summer Outing. Firestone Country Club.

Boston Rubber Group. Summer Outing. Andover Country Club, Andover, Mass.

Index to Advertisers

This index is maintained for the convenience of our readers. It is not part of the advertisers' contract and RUBBER WORLD assumes no responsibility to advertisers for its correctness.

A

Adamson United Co. — Aetna-Standard Engineering Co. — Akron Equipment Co., The — Akron Rubber Machinery Co., Inc., The 125 Albert, L., & Son 125 Alco Oil & Chemical Corp. 50 Aluminum Flake Co. 110 American Cyanamid Co., Intermediate & Rubber Chemicals Dept. 11 American Maintenance Supply Co. 27 American Resinous Chemicals Corp. 40 American Steel Foundries (Elmes Engineering Division) — American Zinc Sales Co. 39 Ames, B. C., Co. 102 Angier Products, Inc. 31 Argus Chemical Corp. 20

B

Baker Castor Oil Co., The — Barco Manufacturing Co. 10 Barr Rubber Products Co., The 112 Barry, Lawrence N. 127 Binney & Smith, Inc. Insert 85, 86 Black Rock Mfg. Co. 121 Bolling, Stewart, & Co., Inc. — Bonwitt, Eric 127 Bridgwater Machine Co. (Athens Machine Division) 105 Brockton Tool Co. — Brooklyn Color Works, Inc. 110

C

Cabot, Godfrey L., Inc. Back Cover Carbide & Carbon Chemicals Co., A Division of Union Carbide & Carbon Corp. 33 Carter Bell Mfg. Co., The 42 Cary Chemicals Inc. — Claremont Waste Mfg. Co. 104 CLASSIFIED ADVERTISEMENTS 123, 125, 127 Cleveland Liner & Mfg. Co., The Inside Back Cover Columbia-Southern Chemical Corp. 25 Columbian Carbon Co. Insert 85, 86 Columbian Carbon Co. (Mapico Color Division) — CONSULTANTS & ENGINEERS 112 Continental Carbon Co. 44, 45 Continental Machinery Co., Inc. 16

D

DPR Incorporated, A Subsidiary of H. V. Hardman Co. 121 Darlington Chemicals, Inc. 113 Dayton Rubber Co., The 106 Diamond Alkali Co. 22 Dow Corning Corp. 115 du Pont de Nemours, E. I., & Co. Elastomers Division Inside Front Cover Durez Plastics & Chemicals, Inc. —

E

Eagle-Picher Co., The 121 Emery Industries, Inc. — Erie Engine & Mfg. Co. 40 Erie Foundry Co. —

F

Falls Engineering & Machine Co., The 95 Farrel-Birmingham Co., Inc. 37, 51 Ferry Machine Co. 102 Flexo Supply Co., The 119 Flightex Fabrics, Inc. — French Oil Mill Machinery Co., The 8

G

Gale, C. J. 127 Gammeter, W. F., Co., The 108 Gelb, R., & Sons, Inc. 127 General Latex & Chemical Corp. 106 General Magnesite & Magnesia Co. 108 General Tire & Rubber Co., The (Chemical Division) 49 Genseke Brothers 21 Gidley Laboratories, Inc. 112 Glidden Co., The (Chemicals, Pigments, Metals Division) 103 Goodrich, B. F., Chemical Co. 3 Goodyear Tire & Rubber Co., Inc., The (Chemical Division) 6, 7 Gross, A., & Co. —

H

Hale & Kullgren, Inc. 112 Hall, C. P., Co., The 28 Harchem Division, Wallace & Tiernan, Inc. 14 Harwick Standard Chemical Co. 47 Hercules Powder Co. — Heveatex Corp. 46 Hobbs Manufacturing Co. — Hoggson & Pettis Mfg. Co., The 50 Holliston Mills, Inc., The — Holmes, Stanley H., Co. — Home Rubber Co. 119 Howe Machinery Co., Inc. 119 Huber, J. M., Corp. 52

I

Indoil Chemical Co. 41 Institution of the Rubber Industry 32

J

Johnson Corp., The 100

K

K. B. C. Industries, Inc. 127

L

Lambert, E. P., Co. 119 Liquid Carbonic Corp., The —

M

Maimin, H., Co., Inc. — Marbon Chemical Division of Borg-Warner 17 McNeil Machine & Engineering Co., The 108 Monsanto Chemical Co. 43 Morris, T. W., Trimming Machines — Muehlstein, H., & Co., Inc. 9

N

National Chemical & Plastics Co., The — National Rubber Machinery Co. — National Sherardizing & Machine Co., The 112 National-Standard Co. — Naugatuck Chemical, Division of U. S. Rubber Co. 5, 23 Neville Chemical Co. 107 New Jersey Zinc Co., The 30

O

Oakite Products, Inc. 104 Ohio-Apex Division, Food Machinery & Chemical Corp. — Oronite Chemical Co. 42

P

Pan American Chemicals, Division Pan American Refining Corp. — Pasadena Hydraulics, Inc. 100 Paterson Parchment Paper Co. 111 Pennsylvania Industrial Chemical Corp. — Pequanoc Rubber Co. 127 Phillips Chemical Co. 4 Pittsburgh Coke & Chemical Co. 99 Pure Carbonic Co., A Division of Air Reduction Co., Inc. 34

R

Rand Rubber Co. 119 Rare Metal Products Co. — Richardson, Sid, Carbon Co. 130 Rotex Rubber Co. — Royle, John, & Sons 46 Rubber Corp. of America 117 Rubber Regenerating Co., Ltd., The —

S

St. Joseph Lead Co. 18 Schlosser, H. A., & Co. 110, 112 Scott Testers, Inc. 110 Sharples Chemicals Inc. — Shaw, Francis, & Co., Ltd. 24 Shore Instrument & Manufacturing Co., Inc., The 125 Skelly Oil Co. — Skinner Engine Co., Rubber Machinery Division 101 Snell, Foster D., Inc. 112 South Texas Tire Test Fleet — Southeastern Clay Co. — Southern Clays, Inc. 38 Spadone Machine Co., Inc. — Stamford Rubber Supply Co., The 48 Stanley Electric Tools 113 Statikil 112 Stauffer Chemical Co. 29 Sun Oil Co. 97

T

Taylor Instrument Cos. — Taylor, Stiles & Co. — Textile Proofers, Inc. 117 Thiokol Chemical Corp. 109 Thomaston Mills 121 Timken Roller Bearing Co., The — Titanium Pigment Corp. 12 Turner Halsey Co. 15

U

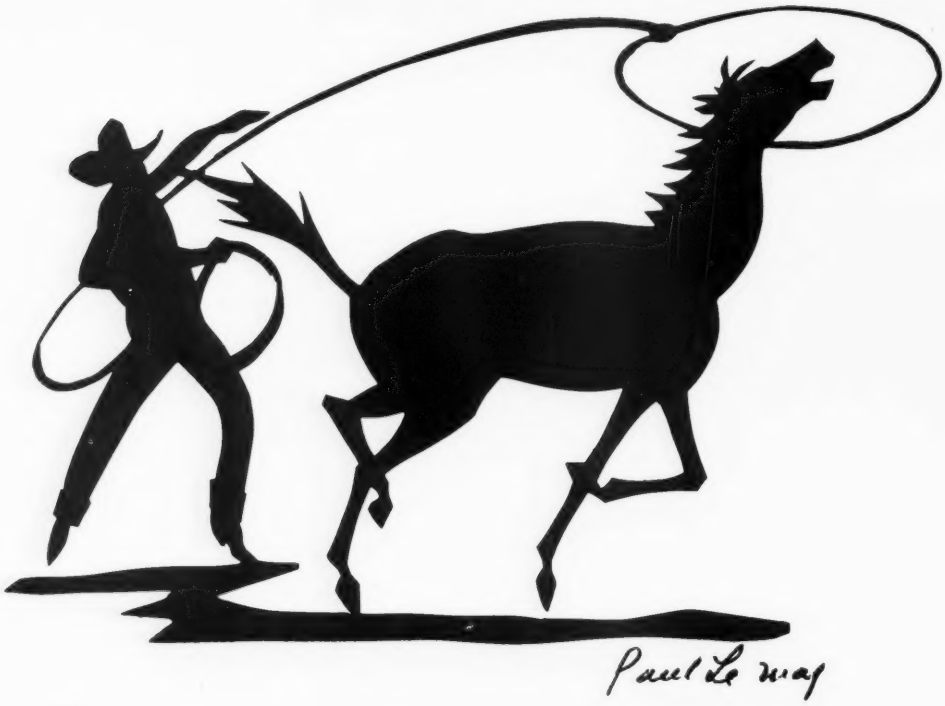
Union Carbide & Carbon Corp., Carbide & Carbon Chemicals Co. 33 United Carbon Co., Inc. Insert 35, 36 United Engineering & Foundry Co. 19 United Rubber Machinery Exchange 125

V

Vanderbilt, R. T., Co., Inc. 54 Velsicol Corp. —

W

Wade, L. C., Co., Inc. 110 Watson-Standard Co. 32 Wellington Sears Co. 26 Wellman Co. 112 Western Supplies Co. — White, J. J., Products Co. 48 Whittaker, Clark & Daniels, Inc. — Williams, C. K., & Co., Inc. — Witco Chemical Co. 44, 45 Woloch, George, Co., Inc. — Wood, R. D., Co. 13



... lost independence

Don't lose your competitive independence — be competitively independent—use ***TEXAS 109*** for quality products manufactured at competitive prices.

Why pay more when you can have ***TEXAS 109*** with all these features — at HAF prices:

Excellent Abrasion

Low Processing Cost

Good Flex Life

High Electrical Conductivity

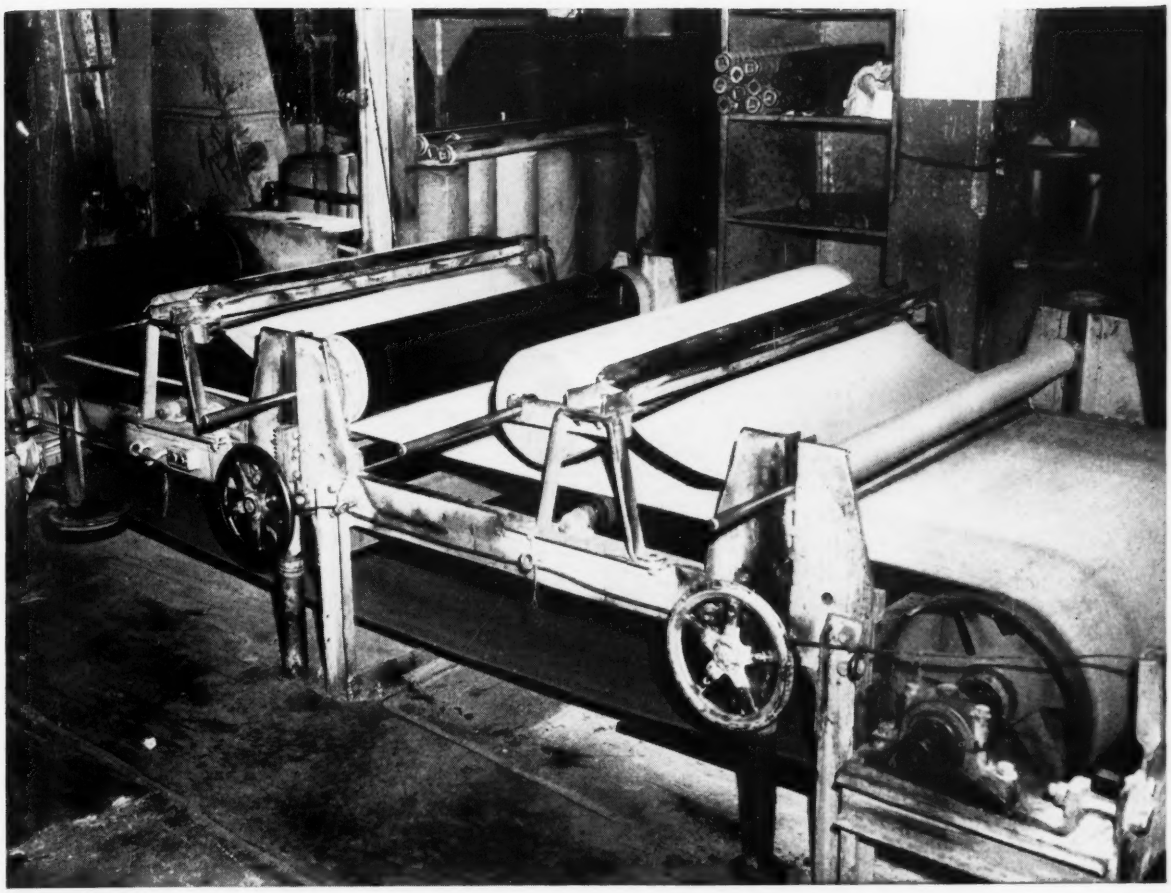
PLUS the security of a continuous supply through our own natural resources.

TEXAS
CHANNEL BLACKS
®

Sid Richardson
CARBON CO.

FORT WORTH, TEXAS

GENERAL SALES OFFICES
EVANS SAVINGS AND LOAN BUILDING
AKRON 8, OHIO



CLIMCO LINERS—

to Preserve and Protect Gum Rubber Sheets

Gum rubber sheets are being rolled into durable, clean liners from the calender. Climco Processed Liners preserve sheet stock; exclude air, moisture, sunlight, maintain tackiness; protect your stock from oxidation, mould, bloom, lint and ravelings.

Climco Processed Liners have been used for 31 years to speed production because they:

Insure better separation
Save power
Eliminate production headaches
Reduce stock losses
Give greater latitide in compounding
Offer longer liner life

TRY THEM IN YOUR PLANT

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio

GET THE FULL STORY ON CLIMCO PROCESSING

Illustrated booklet tells about Climco Liners and Linerette separating paper. Tells how to get better service from liners. Write for your copy now.

LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS

FOR FASTER, BETTER PRODUCTION AT LOWER COST

THE CLEVELAND LINER & MFG. CO. TRADE CLIMCO MARK CLEVELAND OHIO, U.S.A.

On the Road with CABOT *Blacks*

ON THE ROAD TESTS are an important part of the Cabot testing program . . . designed to provide the best reinforcing carbon blacks available. In addition to laboratory and factory tests, Cabot blacks are compounded in various types of rubber, and tires are subjected to miles and miles of grueling road tests. That's why Cabot blacks give consistently longer wear and trouble-free performance in all types of rubber. Complete production quality control further assures the same excellence of performance from every shipment of Cabot blacks.

GODFREY L. CABOT, INC., 77 Franklin St., Boston 10, Mass.